Energy *for the* Future

An Energy Plan for the Northwest Territories

Northwest Territories

March 2007

Cover Photos

Top Left – Smart Car Vehicle Pilot Program, Department of Transportation

Top Right – Ikhil line, 50 kms. north of Inuvik that supplies the town with natural gas.

Bottom – Taltson spillway, located south of Fort Smith in the Northwest Territories. The existing Taltson system has a capacity of 18 megawatts, 8-10 of which is surplus, as shown here.

Energy *for the* Future

An Energy Plan for the Northwest Territories

Industry, Tourism and Investment
Environment and Natural Resources

Government of the Northwest Territories

Message from the Ministers

The Hon. Brendan Bell
Minister of Industry, Tourism and Investment

The Hon. Michael McLeod
Minister of Environment and Natural Resources

In the Northwest Territories we are faced with many challenging issues regarding the development, generation and use of energy. We have a tremendous supply of energy resources, yet the cost of energy in our communities is very expensive, contributing significantly to our high cost of living.

We are also witnessing the serious impact of global energy use on our environment. Temperatures are projected to rise twice as fast in the north as compared to southern jurisdictions, placing us in the front lines in the fight against climate change. It is important that we take a leadership position in working to reduce GHG emissions.

To address these challenges, and strike the right balance between actions promoting economic development and maintaining the integrity of our natural environment, the Departments of Industry, Tourism and Investment (ITI) and Environment and Natural Resources (ENR) have collaborated to develop the following Energy Plan for the Northwest Territories. A companion document, the NWT Greenhouse Gas Strategy, has also been developed by ENR that establishes targets for reductions in greenhouse gas emissions for the Government of the Northwest Territories and encourages other sectors to develop their own emission management plans and targets.

The Energy Plan provides a comprehensive policy and planning framework that will guide future GNWT decisions and actions regarding energy development and use. A focus of the plan is on the actions and investments the GNWT will make to provide residents and communities with the tools required to manage their own energy use through energy conservation and efficiency. Investments in alternative energy sources and the application of emerging technologies in our northern environment are also key objectives of the Energy Plan.

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Wind Monitoring in Inuvik

Photo: JP Pinard

Photo: Great Bear River

Photo: Northwest Territories Power Corporation

1 Executive Summary

The rising cost of energy and the growing impacts of energy use on the environment have led to governments across Canada developing new energy plans or renewing existing energy strategies and plans.

It is well understood that consumers need to use less energy and the current energy supply in the NWT needs to be diversified through greater use of renewable energy sources. While ensuring the integrity of the natural environment, northern governments need to leverage resource development in the NWT to provide a lasting legacy of clean affordable energy for future generations.

To achieve this, the NWT Energy Plan is built around the following key objectives:

i) Develop NWT petroleum and other energy resources, maximize their benefits to northerners and reduce reliance on imported fuel;

ii) Provide the tools required for residents, communities and businesses to implement energy conservation and efficiency initiatives aimed at reducing energy costs and environmental impacts;

iii) Provide information and research on emerging technologies, their potential application in the NWT, and develop Alternative Energy Demonstration Projects;

iv) Reduce the GNWT's energy requirements; and,

v) Create the policy and planning environment to:

- Reduce energy costs and GHG emissions in the NWT;
- Promote efficient regulatory processes with respect to energy; and,
- Maximize the benefits to northerners of NWT energy resource development.

Policy Statement

The Government of the Northwest Territories encourages and supports development of NWT energy resources that contributes to a lasting legacy of affordable energy for all residents, generates resource revenues for northern governments, and demonstrates a strong commitment to protecting the natural environment.

To support these objectives, the following Policy Framework has been developed to guide future actions and decisions of the GNWT with respect to energy development, supply and use in the NWT.

Principles

i) Reliable and affordable energy should be available in all NWT communities.

ii) The use of northern renewable energy for industrial developments should be promoted in a manner that provides for a lasting legacy of affordable and sustainable energy for the benefit of all residents.

iii) Energy development and management decisions should maintain the integrity of the natural environment and recognize the absolute importance of the long-term protection of these natural systems to the economic, social, and cultural well-being of NWT residents.

iv) Regulatory processes related to the development and provision of energy in the NWT should be simply structured and as efficient as possible, while maintaining transparency and accountability.

v) Aboriginal equity positions in large-scale energy development projects on traditional Aboriginal lands should be encouraged and supported.

vi) The Northwest Territories Power Corporation should remain in public control, recognizing the benefits of a public corporation in providing affordable power and promoting a lasting legacy of renewable energy in the NWT.

vii) The GNWT should demonstrate leadership by diligently and responsibly taking actions to reduce its consumption of energy.

A focus of the Energy Plan is on actions and investments that support the above Policy Framework. Actions have been organized into the following five areas:

i) NWT Energy Development and Supply

ii) Energy Conservation and Efficiency

iii) Alternative Energy and Emerging Technologies

iv) Reducing energy Use in GNWT Assets

v) Energy Policy and Planning

Photo: Northwest Territories Power Corporation

Taltson Rapids

i) NWT Energy Development and Supply

Energy development and supply in the NWT plays a critical role in our economy and this role will likely grow over the coming decades. Development of NWT energy resources will provide the foundation for future economic growth in the NWT and provide revenues for the GNWT and Aboriginal governments to provide services to residents. As well, the current high cost of electricity supply in communities served by diesel generation impedes local economic development.

The GNWT currently invests substantially in promoting the development of hydroelectric and petroleum resources and in managing the impacts of such development. Socio-economic agreements, participation in environmental impact assessments and regulatory processes, and the establishment of ongoing monitoring boards ensure that NWT environmental, social and economic interests are addressed.

In the long-term, greater use of NWT hydroelectric resources is a clear strategy of the GNWT. Hydroelectric power is clean, renewable, and insulated from the rising price of oil. In 2007, the

GNWT will develop a comprehensive NWT Hydro Strategy that will identify the investments that need to be made to provide renewable energy for future resource development in the NWT as well as identify small-scale hydro sites that might meet the needs of individual communities. The proposed Taltson River Hydro Expansion to provide power to NWT diamond mines provides an excellent example of the type of investments that can provide substantial economic opportunities for residents and Aboriginal governments while reducing the environmental impact of fuel transportation and use. The GNWT will continue investing in this project to bring it to a point where private markets will finance the development.

Conversion to Natural Gas for the communities of Fort Simpson, Tulita and Fort Good Hope, if the proposed Mackenzie Gas Project (MGP) proceeds, has shown some promise through a desk-top study undertaken by the GNWT in 2006. In 2007, the GNWT will undertake a more detailed analysis of this opportunity.

ii) Energy Conservation and Efficiency

Energy conservation and efficiency provides the most immediate solution to rising energy costs and environmental impacts of energy use in the NWT. Through the Arctic Energy Alliance (AEA), the GNWT funds a number of initiatives aimed at providing residents and communities with the tools required to reduce their energy use. The following are new initiatives and enhanced investments that the GNWT will make in 2007 to provide these tools:

- Assistance for low income housing upgrades;
- Subsidized energy efficiency audits for residents and businesses;
- An Energy Efficiency Financing Assistance Program;
- Support for Community Energy Planning;
- Enhanced support directed towards communities though the Energy Conservation Program;
- Enhanced energy information for communities and residents;
- Expanded use of residual heat and combined-heat power systems; and,
- Enhanced support to the Arctic Energy Alliance (AEA) to better position the AEA in their work with NWT communities.

iii) Alternative Energy and Emerging Technologies

In community consultations associated with the NWT Energy Strategy as well as this Energy Plan, the need for expertise and investment in alternative energy sources and emerging technologies was clearly identified. In the long term, the establishment of a NWT Energy Technology and Climate Change Centre is required. Enhancing GNWT capacity in alternative energy and emerging technologies for potential application in the north is the first step, and in 2007 the GNWT will:

- Establish an Alternative Energy and Emerging Technologies Development Fund;
- Enhance the capacity of the GNWT to develop alternative energy projects and work with communities to demonstrate the application of emerging technologies in the north;
- Expand current wind resource monitoring effor,ts and develop a plan to have a wind turbine operating in the NWT in 2009; and,
- Develop a pilot project for the use of geothermal heat pumps at Aurora College in Fort Smith.

iv) Reducing GNWT Energy Use

The GNWT has a tremendous investment in physical assets, amounting to over $1.6 billion, utilizing more than 20 million litres of fuel. The GNWT needs to lead by example and make additional efforts to reduce the economic and environmental costs associated with GNWT assets.

Through the normal course of operations, GNWT departments undertake a variety of energy efficiency and conservation measures. Recent examples include the evaluation and upgrading of public housing, the testing of hybrid vehicles and the purchase of heat for the North Slave Correctional Centre from commercially-operated wood pellet boilers.

To enhance existing efforts and reduce the costs and environmental impact of GNWT energy use, in 2007, the GNWT will:

- Enhance efforts and resources to effectively manage the energy requirements of GNWT assets and seek out economic opportunities to make energy efficiency upgrades;
- Establish a Capital Asset Retrofit Fund and seek out economic opportunities to make energy efficiency upgrades;
- Begin conversion of three GNWT assets in Fort Smith to interruptible hydroelectric power for heating purposes, reducing GHG emissions by an estimated 800 tonnes;
- Enhance technical capacity to identify energy efficiency opportunities and make investments in conservation and efficiency upgrades for public housing; and
- Continue to develop renewed energy performance standards for GNWT assets.

v) Energy Policy and Planning Environment

A coordinated approach to energy policy and planning is critical to ensuring that activities across the GNWT are appropriately focused on priority areas and that future energy decisions and actions reflect the Policy Framework above. Reporting on government-wide results to inform future versions of the Energy Plan, providing a central source of information on energy in the NWT, and representing GNWT interests at the provincial/territorial, national and international level will continue to be important ongoing actions of the GNWT.

In 2007, the GNWT will implement the following new initiatives:

- Produce the first annual NWT Energy Report providing current energy information and a report on the results of GNWT energy investments and activities;
- Undertake a review of electricity rates, regulation and subsidization in the NWT to provide options for change to the NWT Legislative Assembly in 2008; and
- Undertake additional work with respect to devolution planning.

As a resource-based economy, demand for our mineral and petroleum wealth could provide opportunities to diversify our energy supplies and, by leveraging the energy requirements of northern resource developers, provide a lasting legacy of sustainable and affordable energy for NWT communities.

Ultimately, the options available will be influenced by the nature and pace of future resource development in the NWT. The GNWT is currently undertaking Macroeconomic Policy development aimed at mapping out the likely growth of the economy overall and the anticipated sequence of development, across all sectors of the economy. Future versions of the Energy Plan will need to consider approach to and the pace of development in the NWT desired by residents and northern governments.

Photo: Arctic Energy Alliance

Smart Car purchased by the Department of Transportation in 2006

2 Introduction

As energy costs rise and the environmental impacts of energy use become better understood, most Canadian jurisdictions are reviewing or developing new energy policies and plans. In 2003 the GNWT released the NWT Energy Strategy as an initial framework to guide decisions and activities in the NWT energy sector. This 2007 Energy Plan builds upon that previous work and is intended to:

- Provide a Policy Framework that will serve to guide future government decisions with respect to energy development, supply and use in the NWT; and
- Provide a Planning Framework and identify actions that respond to the concerns that NWT residents identified in numerous meetings on both the 2003 Energy Strategy and this Energy Plan.

The emphasis of the Energy Plan is on actions and investments directed towards ensuring that all residents benefit from:

- The economic development of the North's energy resources;
- Access to reliable and affordable energy;
- The increased diversification of energy supplies;
- A well-managed, protected natural environment; and
- A sustainable energy supply for NWT communities.

These objectives are not new. As far back as 1980, an Energy Strategy was developed for the GNWT that contained the same objectives (for a copy, please visit **www.nwtenergyplanning.ca**). At that time, highlighted actions included the need to improve energy conservation and efficiency efforts, reduce the reliance on diesel fuel and promote the development of NWT hydroelectric resources.

A fundamental objective that was not emphasized in the 1980 Energy Strategy that is of critical importance to northerners is the need to protect our natural environment and mitigate, plan and adapt to the growing impacts of climate change. To underscore the importance of this issue to northerners, the GNWT has released a 2007 Greenhouse Gas (GHG) Strategy. Many of the objectives and actions of this Strategy are closely intertwined with those of the Energy Plan. For example, energy conservation and efficiency measures introduced in the 2007 Energy Plan to reduce the cost of energy are also embodied in the GHG Strategy as means to reduce greenhouse gas emissions. The 2007 GHG Strategy establishes a greenhouse gas target of 10% reduction from 2001 levels by the year 2011 for the Government of the NWT. The Strategy takes a sectoral approach to greenhouse gas emission reductions (community and residential, commercial and industrial, government, and cross-cutting), while the Energy Plan is organized around GNWT actions in five key areas:

i) **NWT Energy Development and Supply**
ii) **Energy Conservation and Efficiency**
iii) **Alternative Energy and Emerging Technologies**
iv) **Reducing Energy use by the GNWT**
v) **Energy Policy and Planning Environment**

The Northwest Territories is blessed with tremendous energy supply potential. When and to what extent our petroleum resources will be developed and pipelines constructed will largely be determined by industry. However, it is important for the NWT to actively promote development of our petroleum resources. The opportunities that arise from this development can be leveraged to develop renewable energy sources and diversify our own energy supply.

As the costs and environmental impacts of fossil fuel generation continue to increase, there will be opportunities for further hydroelectric development. The proposed expansion of the Taltson River hydroelectric facility to supply NWT diamond mines is one example that can provide economic opportunities as well as environmental benefits through displacing over 100 million litres of diesel fuel over the life of the mines.

The general consensus is that the costs of crude oil and petroleum products will continue to be expensive through the long term. This and the need to reduce GHG emissions by lowering the reliance on diesel fuel provide compelling reasons for the GNWT to continue to work towards the development and use of alternative forms of energy.

The GNWT must be prepared to respond to evolving national approaches to energy and the environment, as well as prepare for the responsibilities for NWT lands and resources that currently reside with the federal government. In the years ahead, GNWT energy policy and plans must also reflect how the NWT economy is most likely to evolve from a macroeconomic perspective. The nature and pace of development that reflects the aspirations of NWT residents will be an integral part of future planning in energy.

Photo: Northwest Territories Power Corporation

The Great Bear River

Photo: Energy Planning

Ikhil Natural Gas Line

3 Background

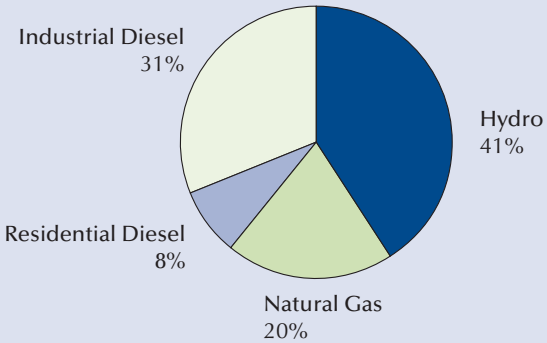
For a detailed overview of the energy sector, NWT energy resources, and energy use and costs in the NWT, please see the attached appendices:

Appendix A: Energy Sector Overview
Appendix B: Energy and the Environment
Appendix C: Energy and the Economy
Appendix D: Energy Outlook

Energy Use

Approximately 70% of the total electricity generated for NWT residents and communities is from hydroelectric power. As can be seen in the chart below, once the electrical generation needs of industry are factored in, this figure drops to 41%.

Figure 1
2005/06 Electrical Generation



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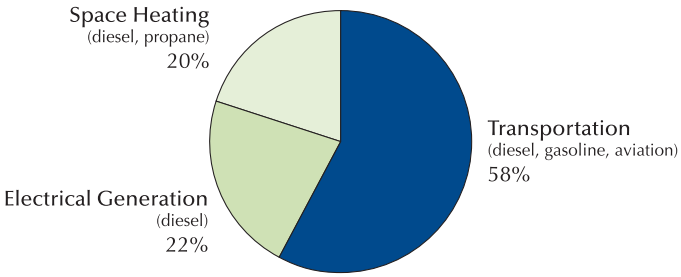
Current Power Supply in NWT Communities

Figure 2

NWT Fuel Consumption by Sector

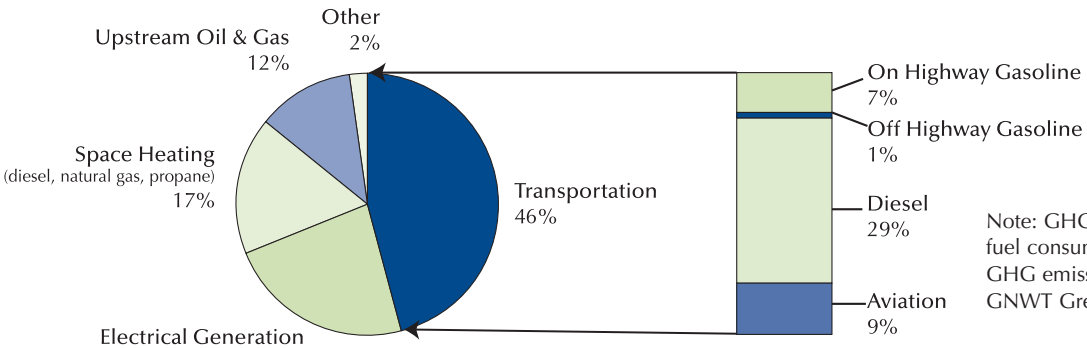
2005/06 - 445 million litres, estimated



A significant amount of natural gas is used for space heating and electrical generation in Inuvik and Norman Wells. However, diesel and gasoline used for transportation, electrical generation, and space heating are the main sources of GHG emissions in the NWT and as such, should be the areas of focus for reducing fuel use.

Figure 3

GHG Emission Sources



A thorough calculation of GHG emissions in the NWT was last completed in 2001, when emissions were 1.7 megatonnes (Mt.)

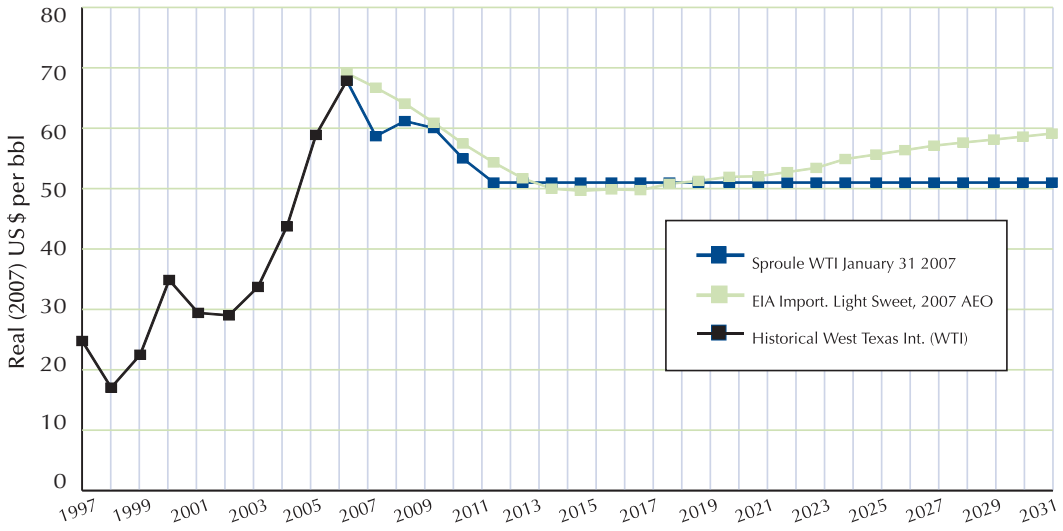
Note: GHG emissions represented by fuel consumption. For a representation of GHG emissions by sector please see GNWT Greenhouse Gas Strategy page 9.

Energy Costs

The consensus view is that the world market price of crude oil (West Texas Intermediate) will fluctuate in the U.S. $45 to $65 per barrel (bbl) range through the next ten to twenty years.[1] The U.S. Department of Energy's Energy Information Administration's (EIA) 2007 Annual Energy Outlook "reference case", and the January 31, 2007 oil price forecast of Calgary-based Sproule Associates Limited, for example, support this view.

Figure 4

Crude Oil Price Forecasts, US $



[1] *On February 8, 2007 the NYMEX closing futures market price for December 2012 light crude oil was US $64.20/bbl.*

The continued growth of natural gas demand in the U.S., coupled with the decline in domestic supply, appears to have resulted in a permanent upward adjustment in the price of gas. As a result, where natural gas was typically trading in the vicinity of U.S. $2 per thousand cubic feet (mcf) a decade ago, market forces are expected to keep the price in the U.S. $5/mcf to $7/mcf range.

Electricity and home heating costs in the NWT, despite subsidization, are significantly higher than in southern regions of Canada. Figures 5 & 6 compare home heating and electricity costs in the NWT with costs in a few locations in southern Canada.

Figure 5
Monthly Power Bill for 700 kWh of Electricity – 2006

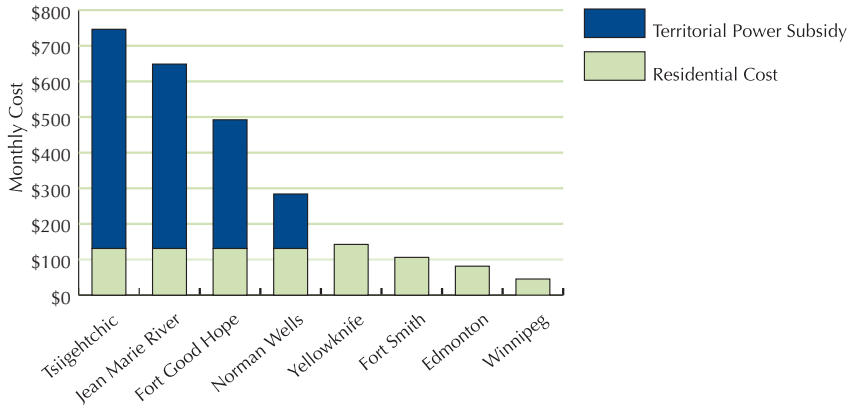
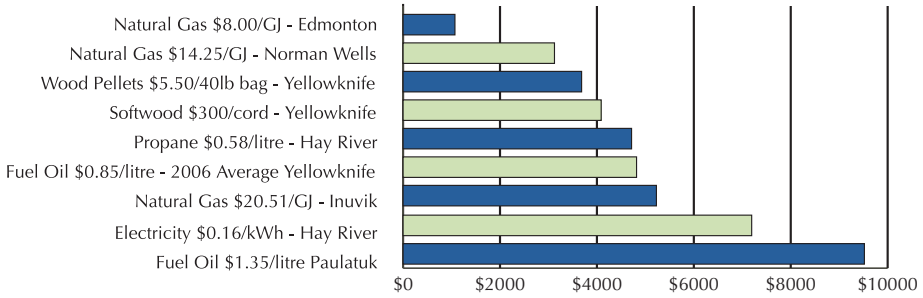


Figure 6
Annual NWT Home Heating Costs



Calculations for Figure 6 are based on a report completed by the Sheltair Group for the Yellowknife Energy Plan. The report, Lifecycle Cost Analysis - Energy Standard for New Buildings, gives oil consumption for an average single-detached home in Yellowknife with an EnerGuide for Houses (EGH) rating of 71. Energy demand was extrapolated to other communities based on heating-degree days, which range from 7,800 in Fort Smith to 8,600 in Yellowknife and 10,700 in Paulatuk. Wood and wood pellets are generally used as secondary sources of heat while fuel oil, propane, and natural gas are most often primary heat sources. Electricity is presented for comparison purposes, but is generally not used for heating purposes as it is not economic without very low-cost power (10 cent/kWh).

NWT Energy Resources

The NWT has abundant petroleum and renewable resource potential. In petroleum supply, there may be 12 billion barrels of potential oil reserves and 75 trillion cubic feet (tcf) of gas reserves in the Northwest Territories. On the renewable side, with over 11,000 megawatts of hydroelectric potential, our northern rivers could be a source of clean, sustainable energy.

Location	**Remaining Established Reserves** (billion barrels)	**Ultimate Recoverable Resource** (billion barrels)
Mackenzie Delta/Beaufort	1.01	6.7
Arctic Islands	0.41	4.7
Mainland NWT	0.08	0.6
Total	**1.50**	**12.0**

Table 1 – NWT Oil Resources

The NWT's developed oil reserves are located at Norman Wells and at Cameron Hills.[2]

Location	**Produced Resource** (billion cubic feet)	**Ultimate Recoverable** (billion cubic feet)
Mackenzie Delta/Beaufort Sea		60,000
Ikhil	3.5	
Mackenzie Valley Corridor		5,000
Cameron Hills	16.7	
Fort Liard	156	
Norman Wells	137	
Arctic Islands		10,000
Totals	**313.2**	**75,000**

Table 2 – NWT Natural Gas Resources

The NWT's developed gas reserves are at Cameron Hills, Fort Liard, Norman Wells and at Ikhil, near the Town of Inuvik.

The Mackenzie Valley Pipeline will trigger further natural gas exploration in the Mackenzie Delta and Valley and eventually, in the Beaufort Sea and the Arctic Islands. There is an estimated 40 trillion cubic feet in the Arctic Islands, 30 tcf of which likely lies within Nunavut.

[2] *Sources:*

- *Canada's Energy Future, NEB 2003. Table A5.1: Ultimate Recoverable Resources*
- *Probabilistic Estimate of Hydrocarbon Volumes in the Mackenzie Delta and Beaufort Sea Discoveries, National Energy Board, 1998.*
- *CAPP Statistical Handbook, November 2006. Table 2.1A*

River	Developed (MW)	Undeveloped Potential (MW)	Proposed Development (MW)
Bear	0	568	126
La Martre	0	27	1
Lockhart	0	269	0
Mackenzie	0	10,450	0
Snare	30	33	13
Snowdrift	0	1	1
Taltson	18	172	35
Yellowknife	7	0	0
TOTAL	**55**	**11,520**	**176**
Slave (AB/NT)		1,500	

Table 3 – NWT Hydroelectric Resources

The vast majority of the Northwest Territories' world-class hydro potential is not yet developed. As illustrated in Table 3, the NWT has over 11,000 megawatts of hydroelectric potential, of which less than 0.5% has been developed.

There are two main advantages to developing and expanding renewable energy in the NWT. First, renewable energy provides a more sustainable and environmentally friendly source of power. Second, investment in renewable energy provides an excellent vehicle for managing risk by helping to diversify the NWT's energy supply mix and act as a hedge against oil and gas price volatility.

There are many opportunities for greater use of alternative energy sources in the NWT in addition to hydro, including wind, geothermal, solar and biomass. The GNWT has implemented a number of solar photovoltaic projects, is currently testing the use of a wood pellet boiler and is undertaking wind resource monitoring in a number of communities. These renewable energy sources are discussed in greater detail in Appendix A.

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NWT Energy Resources

Consultations on Energy

As noted earlier, the 2007 Energy Plan is in part informed by the 2003 Energy Strategy that was widely consulted, involving nearly every community in the NWT. In June 2006 the GNWT released the *Energy for the Future* discussion paper. Consultations were then held with municipal governments and the public in NWT regional centres. During these consultations, a number of key issues were discussed, including;

The Role of the Northwest Territories Power Corporation

There were many views regarding the role of the Northwest Territories Power Corporation. These views ranged from selling the corporation outright to expanding its role in developing alternative energy sources for communities.

As reflected in the Policy Framework, the NTPC will continue to remain in public control. The Corporation's existing strategic direction is to expand its business, improving upon economies of scale for the benefit of all residents. As an instrument of public policy, NTPC is also well positioned to manage GNWT investment in hydroelectric development to bring projects to the point where they can be privately financed. As well, the expertise of the corporation can be leveraged through contributions from the GNWT to help develop alternative energy technologies in our northern environment.

Affordable Energy

The rising cost of energy is a concern across the north, especially so in communities not served by hydroelectric power.

Leveraging the power requirements of industrial developments and increasing sales of northern power will make it possible to expand the present transmission system and bring lower cost electricity to more communities. In the short term, the GNWT needs to review the pricing, regulation and subsidization of electricity and streamline administrative processes to ensure residents and businesses have access to affordable power.

Use of Alternative Energy Technologies

Many questions were raised regarding the potential use of alternative technologies to reduce the cost and environmental impacts associated with community energy supply. Many residents expressed a desire for more information on alternative energy sources. The GNWT was encouraged to make greater efforts in this area.

Support to Communities

The New Deal for Community Governments will see the responsibility for the management of their fixed assets transferred to communities while the Federal Gas Tax Funding program will provide some of the resources needed to manage these assets. In order to prepare for these new responsibilities, many communities asked for access to expert advice and support in developing Community Energy Plans, obtaining federal funding, and implementing local alternative energy solutions.

Energy Development and Protecting the Environment

Many residents underscored the importance of developing our petroleum and other resources to benefit future generations. Many also felt strongly that development has to occur in a coordinated and sustainable fashion. Striking this balance through actions in a number of areas is an important element of the 2007 Energy Plan.

Photo: Northwest Territories Power Corporation

Taltson Rapids

4 GNWT Energy Policy

The GNWT recognizes the role that northern governments and residents can play in Canada's economy and supports development of our energy resources. At the community level, access to reliable and affordable energy is required for the development of local economies. With the growing impacts of climate change, it is critical that our approach to the development and use of energy in the NWT reflect a strong commitment to maintaining the integrity of the natural environment.

The GNWT currently does not have the same degree of control over resource development as the provinces and Yukon Territory due to the lack of jurisdiction over our lands and resources. Canadian provinces and the Yukon Territory can influence development through royalty terms, the pace of rights issuance, and the environmental assessment and regulatory regimes established in their respective jurisdictions. While the tools available are currently limited, there is value in clearly articulating our interests as they relate to development through a Policy Framework. In the future, the GNWT believes that NWT governments will have a stronger voice with respect to how development occurs in our territory following devolution of federal responsibilities.

The Energy Plan Policy Statement and Principles are intended to guide the GNWT approach to the development and use of energy in the NWT. This framework has been built upon the vision and principles of the 2003 Energy Strategy and reflects input from consultations on the *Energy for the Future* discussion paper.

Policy Statement

The Government of the Northwest Territories encourages and supports development of NWT energy resources that contributes to a lasting legacy of affordable energy for all residents, generates resource revenues for northern governments, and demonstrates a strong commitment to protecting the natural environment.

Principles

i) **Reliable and affordable energy should be available in all NWT communities.**

Because energy in the north is a critical service and energy costs heavily impact residents and their local economies, access to affordable power is desirable. Energy regulation and policy should be designed to achieve this.

ii) **The use of northern renewable energy for industrial developments should be promoted in a manner that provides for a lasting legacy of affordable and sustainable energy for the benefit of all residents.**

Renewable energy sources should be tapped to supply new industrial energy requirements wherever possible using appropriate regulatory and policy tools. As well, displacing fossil fuel generation utilized in industrial developments with hydroelectric power is the single greatest opportunity to reduce greenhouse gas emissions in the NWT.

iii) **Energy development and management decisions should maintain the integrity of the natural environment and recognize the absolute importance of the long-term protection of these natural systems to the economic, social, and cultural well-being of NWT residents.**

Balancing the development of NWT energy resources with the need to ensure sound environmental management is a key principle underlying the Energy Plan. The GNWT will remain committed to thorough environmental and socio-economic assessments of proposed developments and ensure that NWT interests are defined in environmental and socio-economic agreements with development proponents.

iv) **Regulatory processes related to the development and provision of energy in the NWT should be simply structured and as efficient as possible, while maintaining transparency and accountability.**

Maximizing the opportunities from future resource development requires a regulatory process that is comprehensive while providing some degree of certainty to ensure that the NWT is a competitive environment for global investment dollars. Devolution of responsibilities from the federal government will provide the opportunity in the long term to ensure that the regulatory environment provides certainty for industry while reflecting the priorities of NWT residents. In the short term, opportunities to streamline the quasi-judicial process for establishing electricity rates in the NWT should be examined to ensure that it is as efficient as possible.

v) **Aboriginal equity positions in large-scale energy development projects on traditional Aboriginal lands should be encouraged and supported.**

It is important for all residents to benefit from development of NWT energy resources. In particular, the GNWT supports opportunities for Aboriginal involvement through equity positions in new developments.

vi) **The Northwest Territories Power Corporation should remain in public control, recognizing the benefits of a public corporation in providing affordable power and promoting a lasting legacy of renewable energy in the NWT.**

The NWT economy cannot support competitive electricity markets due to widely dispersed communities and a lack of economies of scale. In order to ensure secure, reliable electricity for NWT communities, the GNWT will play a continuing role in the provision of electricity supply. Maintaining ownership of the Northwest Territories Power Corporation provides the GNWT with a necessary tool to help ensure that residents are provided with affordable, clean power.

vii) **The GNWT should demonstrate leadership by diligently and responsibly taking actions to reduce its own consumption of energy.**

With over 350 fixed assets that consume approximately 20.8 million litres of fuel (17.7 million of heating fuel and 3.1 million of motive fuel) annually, there are significant economic and environmental gains to be realized by reducing the energy requirements of these assets.

Photo: Northwest Territories Power Corporation

Transmission lines near Yellowknife

5 Energy Plan Objectives

Based on the Policy Framework, the sector analysis and outlook, and consultations with Northerners over a period of several years, important realities have been identified that should be reflected in the Energy Plan:

- Fossil fuels will continue to meet the majority of the world's energy requirements over the coming decades.
- The development of the NWT's petroleum resources is a very important part of the NWT economy and will become increasingly so in the decades ahead.
- The current high cost of energy is a burden to northerners and a barrier to local economic development.
- The NWT's natural gas and renewable energy resources could help to reduce energy costs, protect against rising diesel prices, and contribute to environmental objectives.
- Renewable energy sources such as wind, small hydro and biomass can make an impact on energy supply in the north, but capital investments in diesel will need to be maintained for back-up.
- Greenhouse gas emissions are projected to substantially increase throughout the world in coming decades. As a consequence, temperatures in the north are expected to rise.
- Northerners are concerned about climate change and are eager to do their part in dealing with its impacts but require more information and assistance to do so.

Based on these conclusions, the GNWT has established the following objectives:

i) Develop NWT petroleum and other energy resources, maximize their benefits to northerners and reduce reliance on diesel fuel;

ii) Provide the tools required for residents, communities and businesses to implement energy conservation and efficiency initiatives aimed at reducing energy costs and environmental impacts;

iii) Provide information and research on emerging technologies, their potential application in the NWT, and develop Alternative Energy Demonstration Projects;

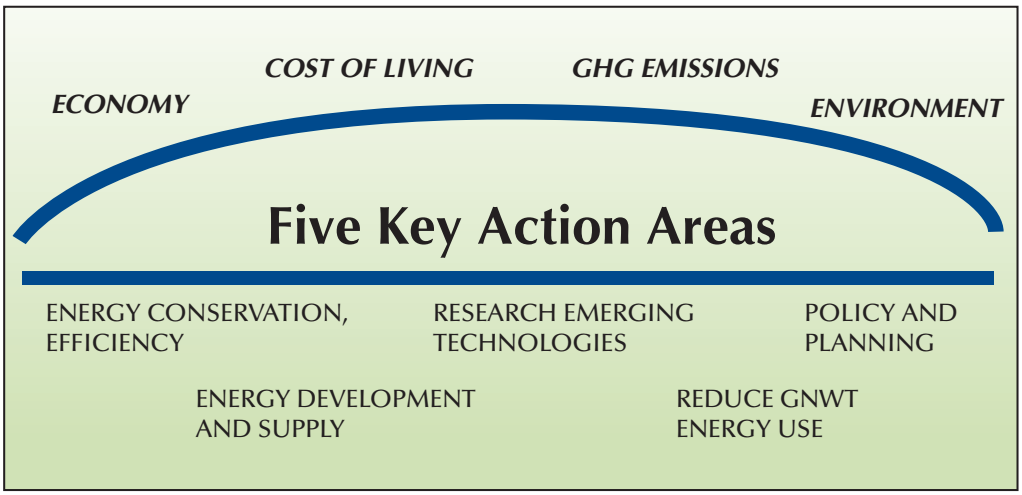
iv) Reduce the GNWT's energy requirements; and

v) Create the policy and planning environment to:

- Reduce energy costs and GHG emissions in the NWT;
- Promote efficient regulatory processes with respect to energy;
- Maximize the benefits to northerners of NWT energy resource development.

These objectives need to be considered through two lenses – the Economy and the Environment.

Energy Plan: A Comprehensive Approach



The NWT economy will be largely dependent upon on the development of energy resources, but as development occurs, the NWT also needs to demonstrate leadership in protecting the environment. The approach to future development in the NWT, and greater utilization of NWT hydroelectric resources, provides the greatest opportunity to meaningfully reduce GHG emissions growth as well as the high cost of energy in the NWT communities.

The two objectives of low cost energy and lower GHG emissions are not always compatible. For example, while diesel generation is the most reliable and economical source of heating and power generation in small communities, it is also a source of GHG emissions

Many of the actions required to achieve the Energy Plan objectives can be done relatively quickly by individuals and communities with little or no cost. Others aimed at improving economies of scale and changing the energy supply mix in the NWT will require more funding and could take a number of years to achieve.

The following actions are aimed at short term measures as well as establishing the long-term approach required to achieve the objectives of the Energy Plan.

Photo: Arctic Energy Alliance

EnerGuide for Houses Audit: Doing a blower-door test to determine air infiltration.

6 New Actions

While the development of a Policy Framework is an important component of the NWT Energy Plan, consistent with what was heard during consultations, a primary focus is on actions and strategic investments. The GNWT currently makes substantial investments in each of the broad areas identified (see Appendix E). The following table presents a summary of the new actions and enhancements as well as the outcomes. This table is followed by a more detailed discussion on each action area.

NWT ENERGY DEVELOPMENT AND SUPPLY

ACTIONS	OUTCOMES
Develop an NWT Hydro Strategy	A comprehensive Hydro Strategy will be completed by November 2007. A proposed $2 million investment in 2007/08 will lead to construction on the proposed Taltson expansion starting in late 2008.
Converting NWT Communities to Natural Gas	A proposed $100,000 investment towards additional analysis on the feasibility of converting some communities to natural gas will be completed in 2007/08. A detailed plan to be completed by 2009.

ENERGY CONSERVATION AND EFFICIENCY PROGRAMS

ACTIONS	OUTCOMES
CARE Program: Low Income Housing Upgrades	This $2.5 million program will target 30%, or $750,000 annually to energy efficiency improvements in low-income households for the next two years.
EnerGuide for Houses (EGH)	A proposed $150,000 in support of energy efficiency audits for residents will result in 160 first-time audits and 60 follow-up audits in 2007/08. A 30% increase in audits conducted outside of Yellowknife is targeted.
Energy Efficiency Financing Assistance Program	$400,000 in proposed grants will provide an incentive for at least $4 million in energy-saving investments by residents, including capital upgrades, wood and wood-pellet stoves, appliances and hybrid vehicles.
Community Energy Planning (CEP)	$150,000 will be contributed to the Arctic Energy Alliance to support the completion of 10 CEPs per year. All NWT communities will have Community Energy Plans in place by 2010.
Energy Conservation Program (ECP)	$200,000 in existing funding to be directed towards community governments and non-government organizations for energy conservation and efficiency improvements. This investment is targeting reduced energy costs of $80,000 per year and reduced GHG emissions of 200 tonnes per year.
Expansion of Residual Heating Systems	Analysis will commence immediately and required project funding will be identified by September 2007. A target has been set to implement three projects by 2008.
Energy Information and Awareness	A proposed $100,000 ongoing enhancement to improved energy facts and information for residents and communities available through the Arctic Energy Alliance.
Support for the Arctic Energy Alliance	Proposed ongoing support of $150,000 per year for the AEA will increase their community presence with regard to programs such as EGH by 30% in 2007/08.
Commercial Energy Efficiency Audits	A proposed $100,000 investment will support commercial energy audits. A total of 20 commercial energy efficiency audits will be completed in 2007/08.

ALTERNATIVE ENERGY AND EMERGING TECHNOLOGIES

ACTION	OUTCOME
Enhance Capacity for Alternative Energy Development	A proposed ongoing investment of $250,000 will support a central source of expertise with respect to alternative energy solutions and provide expert advice and analysis to the GNWT and other northern governments.
Alternative Energy & Emerging Technologies Development Fund	A proposed $200,000 fund will result in three feasibility studies and/or demonstration projects per year in NWT communities, preferably in partnership with other governments.
NWT Wind Development	A proposed $100,000 investment will extend wind monitoring to three more communities by 2008. Detailed business case developed and site chosen for an operating turbine in 2008. An operating wind turbine by 2009.
Heat Pump Pilot Project, Aurora College, Fort Smith	$100,000 proposed investment to install one heat pump in 2007/08. Final project completion and evaluation of energy cost savings and GHG emission reductions to be completed in 2008/09.

REDUCING GNWT ENERGY USE

ACTION	OUTCOME
Fort Smith Electrification of GNWT Assets	A proposed $1 million investment in converting three GNWT assets to interruptible power will initially result in cost savings of $200,000 per year for five years starting in 2007/08. Savings to be re-invested in other energy-saving projects.
Capital Asset Retrofit Fund	A proposed $100,000 fund for major capital upgrades to grow to at least $1 million by 2008/09. 25 energy audits completed on buildings with the greatest potential for energy and cost savings by 2008. Thermal scans on 350 buildings complete by 2009.
Energy Management of Public Housing	Internal resources will establish energy management technical capacity and a proposed $100,000 investment will result in a Status Report on Energy Efficiency for Public Housing developed in 2007. Identified energy efficiency projects to be implemented in 2008.
Energy Performance Standards	The Good Building Practices Manual will be revised in 2008 to incorporate new technologies and updated building practices. Best practices in housing envelope design will be considered for new public housing design in 2010.

POLICY AND PLANNING

ACTION	OUTCOME
Review of Electricity Regulation, Rates, and Subsidy Programs	Options developed by 2008 for an overall approach that can ensure affordable electricity services for NWT residents and businesses.
Devolution Planning	Options developed by 2009 for organizational design that reflects new responsibilities to be shared with Aboriginal governments.
NWT Energy Report	An updated environmental scan and report on energy plan results produced in 2008.

NWT Energy Development and Supply

The development of NWT petroleum resources will play a critical role in the future of our economy and in the generation of revenues for northern governments. The GNWT invests substantially in promoting the development of petroleum resources and in managing the impacts through the work of the many departments. Socio-economic agreements, environmental assessment and regulatory processes, and the establishment of ongoing monitoring boards ensure that NWT environmental, social and economic interests are addressed.

The development of NWT petroleum resources provides an opportunity to diversify the NWT energy supply mix and reduce the costs of generating electricity in the long term. As discussed earlier, the price of fossil fuels has increased substantially in recent years and most analysts agree that higher prices are here to stay.

Achieving a significant reduction in the use of imported fuel in the NWT is a long-term goal and the development of northern hydroelectric resources and the conversion of communities to natural gas for electricity and heating appear to be the best opportunities to help realize this goal.

1. NWT Hydro Strategy

The tremendous hydroelectric potential in the NWT noted earlier points to this energy source as the most feasible solution to providing residents with renewable energy for many decades into the future. Exporting hydroelectricity to southern markets represents the greatest contribution the NWT can make towards the global effort required to reduce GHG emissions. As the costs and environmental impacts of burning fossil fuel in the south continue to rise, NWT hydroelectric development will become economically feasible.

Current NWT hydroelectric facilities are primarily the result of leveraging industrial development and investment by the federal government. This approach needs to continue as development in the NWT proceeds. The GNWT needs to ensure that the use of renewable hydroelectric energy is promoted and that upfront work is completed, to be prepared for future development.

As an example of the benefits of such upfront work the proposed Taltson expansion is prepared to enter the environmental assessment process. This project has the potential to annually displace 114 million litres of diesel and 320 kilotonnes of GHG emissions, and provide economic opportunities for Aboriginal governments. The federal government has recognized the importance of this work by recently contributing $1 million towards the engineering and environmental work required to move this project forward. This work is being led by the Akaitcho Territory Government, the Northwest Territories Métis Nation and the Northwest Territories Energy Corporation (NWTEC, a subsidiary of NTPC).

In addition to the economic opportunities provided to Aboriginal governments, all residents of

Photo: Industry, Tourism and Investment

Super B Truck-Trailer

	Annual	Total	Measurement
Diesel displaced by Hydro	108	871	million litres
Reduction in transportation fuel use	6	49	million litres
Total displaced diesel	**114**	**920**	**million litres**
Total GHG reduction	**0.32**	**4.2**	**megatonnes**

Table 4 – GHG Reduction Potential of Taltson

**NWT Emissions Total: 1.75 megatonnes (2001)*

The Taltson Project would remove nearly 1800 Super B Truck-Trailer Units from the highway each year. This would have a significant, positive impact on highway safety and maintenance. The removal of these trucks would also reduce diesel consumption by an additional 6 million litres/year or 49 million litres over the anticipated life of the diamond mines.

the NWT will benefit from the development of this energy infrastructure. Increased sales will improve the challenging economies of scale in the production of electricity in the north, ultimately resulting in lower electricity rates for all residents.

Action

Through the NWTEC, the GNWT proposes to contribute $2 million in 2007/08 towards continued work on the expansion of the Taltson system to provide hydroelectric power to NWT diamond mines. The NWTEC and the Department of Industry, Tourism and Investment will also work collaboratively to develop a hydroelectric strategy that will:

1. Provide a comprehensive inventory of NWT hydroelectric resources for potential use by communities, industrial development, and export;
2. Prioritize potential hydroelectric opportunities based on the expected nature and sequence of resource development in the NWT; and
3. Conduct high-level economic analyses of these opportunities.

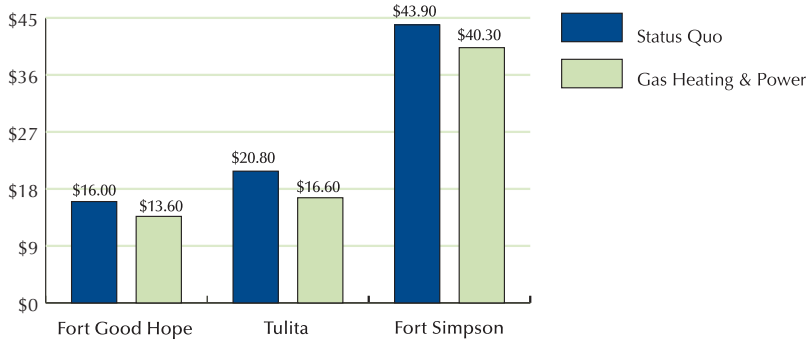
Outcome

A comprehensive Hydro Strategy will be completed by November 2007. Depending upon the environmental assessment process, construction on the proposed Taltson expansion could commence in September 2008.

2. Natural Gas Conversion: Next Steps

In the fall of 2006, the GNWT released a pre-feasibility study on the potential to convert some Mackenzie Valley communities to natural gas for electricity generating and home heating. This study concluded that for three communities in close proximity to the proposed Mackenzie Valley Pipeline (Fort Simpson, Tulita and Fort Good Hope), conversion to gas appears economic and that over a 20 year period, total heating and electricity generation costs would be marginally less expensive than the costs of relying solely on diesel.

Figure 8
Discounted Cost – $2006 Millions



One product developed through the study was a model that can be used to determine the economics of opportunities for other communities with access to natural gas. The GNWT, through the Mackenzie Gas Project Socio-economic Agreement, has also secured a commitment from the project proponents to assist in providing access to natural gas for small market, residential, commercial and institutional consumers in the NWT, should the project proceed.

Action

In order to further determine the potential for conversion of some communities to natural gas, working with interested communities, the GNWT proposes to invest $100,000 in more detailed feasibility and cost analyses that will include:

- the costs of possible distribution pipelines and facilities;
- detailed demand analysis; and
- examination of potential synergies from the construction of the MGP.

Outcome

Detailed feasibility analysis will be completed in 2008, and a plan to convert some NWT communities to natural gas will be completed by 2009.

Fluorescent Light Bulb

Energy Conservation and Efficiency

High cost fossil fuels and wood products will continue to meet the heating requirements of northerners for many years and the cost of generating and distributing electricity in the disparate NWT communities will always be higher than any other Canadian jurisdiction, other than Nunavut. Opportunities to reduce these costs need to be supported.

An emphasis needs to be placed on energy conservation, efficiency and planning at the community level. Conservation and efficiency measures provide the most immediate solution to reducing the costs and environmental impacts of energy use.

Following are a number of new actions and enhanced investments aimed at providing communities and residents with the tools required to reduce electricity use and heating fuels through conservation and efficiency:

Support for Residents:

- Contributing Assistance for Repairs and Enhancements (CARE) Program
- EnerGuide for Houses (EGH) Program
- Energy Efficiency Financing Assistance Program

Support for Communities:

- Community Energy Planning
- Community Energy Conservation Program
- Expansion of Residual Heat and Combined Heat-Power Systems

Other Program Enhancements

- Commercial Energy Efficiency Audits
- Energy Information and Awareness
- Support for Arctic Energy Alliance

Support for Residents

There are over 7,000 homeowners in the NWT who could benefit from assistance to reduce their energy costs while limiting the environmental impacts of energy use. The GNWT will enhance existing efforts through three programs aimed at providing residents with the tools and incentives to make energy saving investments.

1. Contributing Assistance for Repairs and Enhancements (CARE)

Contributing Assistance for Repairs and Enhancements (CARE) will assist existing homeowners in making necessary repairs to ensure a safe and healthy residence with an increased economic life. Assistance will provided in the form of a forgivable loan to subsidize the cost of preventative maintenance checks, repairs and renovations. The forgiveness period is dependent on the amount of assistance being provided.

The financial assistance is provided in increments based on the applicant's income, family size, and a measure of community need called the Core Need Income Threshold (CNIT). Additional assistance is available for improving the accessibility of dwellings for persons with disabilities.

All applicants must be homeowners, 19 years of age or older, and have lived In the NWT for three years, including one continuous year in the community prior to approval. Applicants must be below the Core Need Income Threshold (CNIT) for their community, and applicant(s) must successfully complete the Home Maintenance & Repair course offered by the Housing Corporation prior to receiving assistance.

Action

The NWT Housing Corporation will target up to 30%, or $750,000 of total CARE funding to energy efficiency improvements for low-income households.

Outcome

This $2.5 million program will result in $750,000 in energy efficiency improvements in low-income households for the next two years.

2. EnerGuide for Houses (EGH)

EnerGuide for Houses

The EGH program subsidizes energy efficiency audits that rate the energy efficiency of homes before and after energy efficiency improvements are made (an "A" audit and a "B" audit). This tool has been recognized by nearly all provincial and territorial jurisdictions as essential in providing a rating system to measure efficiency improvements as well as a basis for incentives for energy-saving investments. Historically, grants were available from the federal government to provide an incentive to homeowners to invest in the energy efficiency of their homes. The federal government is currently in the process of developing a Ecoenergy for Retrofit program, and while details are not yet known, the high cost of these services requires GNWT financial support.

Action

Further improvement to the accessibility of these services in communities outside of Yellowknife is required. The GNWT proposes to invest $150,000, through the Arctic Energy Alliance to ensure that home energy audits are affordable for all NWT residents.

Outcome

Energy audit targets are 160 A audits and 60 B audits in 2007/08 and a 30% increase in audits conducted outside of Yellowknife.

3. Energy Efficiency Financing Assistance Program (EEFAP)

While the EGH program provides incentives for energy efficiency assessments for homeowners, the EEFAP will supplement that incentive by assisting homeowners to finance energy-saving investments. Contributions will be based on a percentage of the value of the investment made by the homeowner. These investments will range from improving the energy efficiency of homes such as insulation, upgrading windows, high efficiency heating systems, wood and wood pellet stoves, a selection of EnergyStar appliances to the purchase of hybrid vehicles and "smart cars".

Action

The GNWT proposes to provide $400,000 in incentives for residents to make energy-saving investments in their own homes, or in hybrid vehicles or "smart" cars.

Outcome

This additional incentive to the EGH program will contribute towards the achievement of energy efficiency targets identified in energy audits. The proposed $400,000 amount will promote at least $4 million in energy-saving investments by NWT residents.

Support for Communities

The New Deal for NWT Community Governments will transfer full authority for infrastructure acquisition and development to community governments, effective April 1, 2007, along with formula funding for infrastructure development. The Gas Tax Funding Agreement with Canada supplements this funding by providing funds that are flowed directly to community governments for the development of environmentally sustainable municipal infrastructure, including water and sewage services, solid waste, active transportation, dust control, and capacity building. As part of the five-year funding agreement, community governments are required to develop Integrated Community Sustainability Plans, one component of which will be a Community Energy Plan.

It is important that the GNWT ensure communities have access to the necessary technical support as they assume these new responsibilities. The following initiatives are intended to support communities in reducing their energy use and costs.

4. Community Energy Planning

Support for Community Energy Planning allows communities to identify energy saving opportunities at the local level. The process of completing a CEP requires considerable time and effort, and staff resources within the Department of Municipal and Community Affairs as well as dedicated resources within the Arctic Energy Alliance will be available to provide support to communities. A full-time CEP Development Coordinator has already provided communities with a planning template and led a workshop for all communities in the development of their plans.

Action

The GNWT will provide $150,000 in support for the Arctic Energy Alliance (AEA) in each of the next two years to provide advice and support to communities in their development of CEPs.

Outcome

Ten CEPs will be completed per year and all NWT communities will have Community Energy Plans in place by 2010.

5. Energy Conservation Program (ECP)

The Energy Conservation Program has been offered by the Department of Environment and Natural Resources to GNWT departments, municipal governments, and non-government organizations for many years. In the future, this fund will be focused solely on community governments and non-government organizations.

Initiatives funded under this program include a mix of emerging alternative energy choices such as solar hot water heaters, photovoltaic panels, assistance with furnace or boiler efficiency upgrades for buildings, or investigating the feasibility of installing a wood-pellet boiler such as was recently done in the North Slave Correctional Centre in Yellowknife. Energy efficiency capital retrofits are also eligible. Identified projects are eligible for up to 50% of the required funding.

Action

Total funding in this area (currently $200,000 per year) will be focused on community governments and non-government organizations.

Outcomes

Based on a five-year payback and data related to this program in years past, a $200,000 investment in energy conservation and efficiency improvements in community and NGO assets will provide more than $80,000 per year in savings and reduce GHG emissions by more than 200 tonnes per year.

6. Expansion of Residual Heating Systems

CHP System in Inuvik

Photo: Energy Planning

Residual heat from power plants is being utilized in most of NTPC's power plants and is being sold in a number of communities. There are also two combined heat and power (CHP) micro turbine systems installed in the Inuvik Rec Centre. Utilizing residual, or "waste" heat from power generation is a proven technology that can have substantial impacts on both energy costs and GHG emissions.

While many of the economic opportunities for the use of residual heat have been realized, rising fuel costs point to the need to re-evaluate opportunities that may not have been economic in the past. Often, larger community and GNWT buildings provide the best opportunity for installing residual heating systems.

Action

The NTPC will undertake the evaluation and planning required to expand the use of residual heat and combined-heat power systems in NWT communities.

Outcome

Required project funding will be identified by September 2007. A target of three projects to be implemented in 2008.

Other Enhancements

Energy information and advice for communities and residents, and supporting businesses in high-cost communities to manage their energy costs are areas that have been identified for enhancement.

7. Energy Information and Awareness

By providing core funding to the Arctic Energy Alliance, the GNWT funds the development of energy information and marketing support materials. Many community leaders have noted that more information focused on practical and immediate actions that residents can take to reduce their energy costs would be beneficial.

Action

Energy information and marketing efforts will be continued and enhanced funding of $100,000 is proposed in 2007/08 to ensure that the information provided responds to the concerns raised by community leaders. Public information campaigns will continue to be provided and there will be a renewed emphasis on energy data and facts that can be accessed at the AEA website.

Outcome

Energy facts and information will be made available to residents and communities through the AEA website and other publication materials.

8. Support for Arctic Energy Alliance (AEA)

Communities and residents have indicated that additional support is required to assist in developing energy plans, implementing energy conservation and efficiency measures, and examining potential alternative energy solutions. A central source of expert advice and support is important for community governments and residents to take advantage of the tools discussed above.

The AEA plays an important role in delivering programs to residents and communities. Supporting communities in developing their Community Energy Plans and providing expert advice to communities and residents as they manage their own energy needs are also critical functions. The success of GNWT programs aimed at residents and communities is very much dependent upon the capacity of the AEA to deliver these programs. As well, the capacity of AEA to provide support to all communities is dependent upon an appropriate level of resources, the primary source of which is the GNWT.

AEA will be resourced to spend more time in communities. In the long-term. The AEA will be able to establish regional positions to better provide support to communities. However, as noted in the environmental scan, recruitment of energy specialists in the current economy is very challenging and this has been a significant issue for the AEA in recent years. Enhanced capacity to provide services and support to communities and a long-term commitment to the AEA are required.

In 2005/06 the GNWT provided $197,000 in core funding support:

Action

The GNWT proposes to increase annual core funding to the AEA in the amount of $150,000 to ensure that the AEA has the required resources to focus on energy conservation and efficiency programs and support for NWT residents and communities.

Outcome

In 2007/08, the AEA will increase their community presence by 30%.

9. Commercial Energy Efficiency Audits

Businesses in the NWT are large energy users and in many small communities, these businesses use a substantial portion of the local energy supply. High energy costs for local businesses contribute to the high cost of living in many communities. Support for commercial energy auditing services, and in the longer term, development of private sector capacity to provide these services in communities will assist businesses in reducing their energy costs.

Action

The GNWT proposes $100,000 to support Commercial Energy Auditing Services to be provided through the Northwest Territories Power Corporation (NTPC). These services will be available to all large businesses using thermally-generated electricity.

Outcome

Commercial energy audits will be prioritized based on those businesses who have applied and can demonstrate the greatest need. A total of 20 Commercial Energy audits will be provided in 2007/08.

Alternative Energy and Emerging Technologies

In consultations with communities the need for expertise and investment in alternative energy sources and emerging technologies was clearly identified. In the long term, the establishment of a NWT Energy Technology and Climate Change Centre is required. Improving the GNWT's knowledge of alternative energy and emerging technologies is the first step.

1. Enhance Capacity for Alternative Energy Development

A central source of expertise is required to examine the feasibility of alternative energies and their potential application in the north, and to remain current with respect to the accelerating research and development taking place in other jurisdictions. Community governments require a central source of information when examining alternative energy solutions in their own communities.

Action

Proposed establishment of $250,000 in core funding for alternative energy and emerging technologies information and expertise within the GNWT.

Outcome

A central source of expertise with respect to alternative energy solutions that provides expert advice and analysis to the GNWT and other northern governments.

2. Alternative Energy & Emerging Technologies Development Fund

With the growing impacts of climate change and the rising cost of fossil fuels, research into alternative energy and the potential for application in the north is required. There are many alternative energy solutions that have potential for implementation in the north. Wind energy development, discussed below, geothermal energy, immersion hydro, and biomass are just some of the alternative energy sources that could be employed in the NWT.

Biomass Heating System (Or Wood Pellet Boilers) – North Slave Correctional Facility, Yellowknife (PW&S)

Photo: Energy Planning

Action

Establish funding (proposed for $200,000 annually) for research into the feasibility of alternative energy in the north as well as development of demonstration projects in partnership with community governments.

Outcome

Three feasibility studies and/or demonstration projects per year in NWT communities. Results of projects researched and developed will be detailed in an annual NWT Energy Report.

Illustration: Wind turbine

3. NWT Wind Development

Wind is an attractive energy source because of its low environmental impact and its ability to reduce dependence on diesel fuel. When combined with diesel-fired generators in remote communities, the power offsets diesel use and reduces greenhouse gas emissions. Wind can also contribute to a diversification of the energy supply in the NWT and provide energy at a price that is not linked to international markets.

There are currently no operating large-scale wind turbines in the NWT, but a few projects in the past attempted to install turbines in remote diesel communities. These projects did not succeed due to a variety of reasons:

- The use of technology that was not proven in harsh northern conditions;
- A lack of technically trained personnel to service installations;
- The selection of communities that are among the most remote, thereby raising costs and presenting technological and logistical challenges; and
- A lack of government commitment.

Numerous factors currently contribute to making wind a more feasible energy source for the NWT: advances in wind technology, the establishment of turbines in other cold-climate regions, the increased cost of fossil fuels, and concerns regarding climate change. Government commitment is required to develop wind energy.

Action

The GNWT proposes to invest $100,000 in additional wind monitoring equipment and the development of feasibility studies to develop NWT wind resources.

Outcome

An expansion of wind monitoring to three additional NWT communities will occur in 2008. Detailed business case developed and site chosen for an operating turbine in 2008. An operating wind turbine by 2009.

4. Geothermal Energy, Aurora College, Fort Smith

In 2001, Thebacha Campus began work for a heat pump system by installing 20 kilometres of underground piping. In a heat pump system, these pipes carry heat transfer fluid that draws heat from the soil in winter for heating purposes and takes advantage of cooler ground temperatures in the summer for building cooling systems.

Action

The GNWT proposes to undertake $100,000 in additional work on this project in 2007/08, including the testing of the existing piping and the installation of a heat pump to document potential energy cost savings and GHG emission reductions.

Outcome

The pilot project will be evaluated in 2008/09 and the full heat pump system targeted for installation in 2008/09.

Reducing GNWT Energy Use

The GNWT has 350 buildings and other structures that utilize 17.7 million litres of heating fuel per year. It is therefore critical that the GNWT lead by example and make additional efforts to reduce the economic and environmental costs associated with GNWT assets.

The Department of Transportation (DOT) is one of the largest consumers of energy within the GNWT through the operation and maintenance of the territorial system of airports, highways and ferries. There are many opportunities to reduce the use of energy used for transportation. Ongoing activities include:

- The use of Intelligent Transportation Systems to minimize unnecessary vehicle delay;
- Investigating and implementing new technology such as hybrid vehicles, the replacement of main propulsion engines for the MV Louis Cardinal ferry and the installation of in-line fuel heaters to warm vehicle interiors resulting in decreased idling; and
- Implementing the GNWT Vehicle Usage – Energy Conservation Program and monitoring and educating GNWT staff with respect to fuel consumption and fuel-efficient driving practices, especially winter driving practices.

As can be seen in Appendix F, the Department of Public Works and Services (PWS), the Northwest Territories Housing Corporation (NWTHC), and the Northwest Territories Power Corporation have all been implementing a wide variety of energy conservation and efficiency measures through their normal course of business.

The implementation of improved building standards, the evaluation and upgrading of public housing, the testing of hybrid vehicles and a wood pellet boiler are examples of recent initiatives undertaken by these departments. To ensure that such efforts are continually renewed, the following new actions are planned.

1. Fort Smith Electrification of GNWT Assets

There are currently 8 to 10 megawatts of excess electric generation capacity available at the Taltson hydroelectric facility [a result of the closing of the Pine Point mine]. The use of this power for heating purposes in Fort Smith has been discussed for a number of years. A fundamental issue that has not supported the conversion of community buildings and residences to electricity is that at current oil prices, electricity needs to be sold in the range of 10 cents per kilowatt hour to be competitive with fuel oil. This is substantially lower than the local rate established by the Public Utilities Board and lower than the price that isolated NWT diamond mines are likely prepared to pay. Once a building is converted, electricity could never be sold at the market rate. If this power is sold on an "interruptible" basis, customers would have to pay the market rate if other uses for this power become available.

Fort Smith Electrical Heating Conversion Project: using surplus power from the Taltson Hydroelectric Facility.

Photo: Northwest Territories Power Corporation

As discussed above, the NWTEC is preparing to enter the regulatory phase for the Taltson expansion to sell power to NWT diamond mines. Accounting for the potential sales, there is a small amount of excess power (160 kw) that can be transmitted to Fort Smith without substantial transmission facility upgrades.

Action

The GNWT proposes to invest $1 million in 2007 to convert the Thebacha Campus Records Storage Building, Breynat Hall, and JBT Elementary School to electric heat. These actions will reduce GHG emissions by an estimated 800 tonnes per year.

Outcome

At an initial price of 0.9 cents per kilowatt-hour, cost savings of $200,000 per year will be re-invested in energy-saving projects. After five years the price of the electricity will be adjusted to a level competitive with fuel oil.

2. Establish a Capital Asset Retrofit Fund

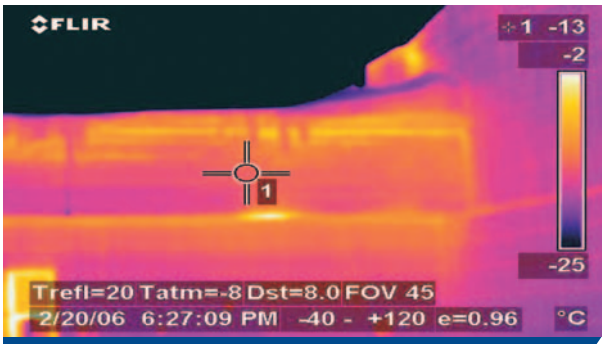


Photo: Public Works and Service

Infrared Thermal Scanning - Albert Wright School, Tulita. Shows heat loss through the wall.

The Department of Public Works and Services (PWS) recently purchased an infrared thermal scanner to detect areas of heat loss in buildings. The scanner will assist in the evaluation of energy efficiency in 350 buildings managed by PWS. Energy audits will be done on the buildings and a plan will be developed for continual upgrades. Early results indicate that there is considerable opportunity for reductions in energy requirements. Capacity to undertake audits and the establishment of a Capital Asset Retrofit Fund to take advantage of energy-saving opportunities is required.

Action

In 2007/08 it is proposed that $100,000 in funding will be established and future savings from projects such as the Fort Smith electrification project will be re-invested into further energy efficiency improvements in GNWT assets.

Outcome

Fund for major capital upgrades to grow to at least $1 million by 2008/09. By 2008, 25 energy audits completed on buildings with the greatest potential for energy and cost savings. Thermal scans on 350 buildings complete by 2009.

3. Energy Management of Public Housing

The NWT Housing Corporation (NWTHC) manages over 2,300 public housing units and highly subsidizes energy services within these units. Energy efficiency initiatives will provide a significant return on investment.

Action

The NWT Housing Corporation will enhance technical capacity to review and identify and implement energy efficiency programs and upgrades for public housing and an energy efficiency survey will be conducted to identify opportunities for energy efficiency improvements.

Outcome

A Status Report on Energy Efficiency for Public Housing to be developed in 2007, with a target of 700 units. Energy efficiency projects implemented in 2008, and all 2,300 housing units reviewed by 2009.

4. Energy Performance Standards

Retrofits, though necessary on inefficient buildings, are more expensive than ensuring that buildings are efficient when first constructed. Life-cycle cost analysis needs to be considered in new building construction estimates to minimize energy use.

The Department of Public Works and Services (PWS) builds and maintains the GNWT's facilities and all facilities are built using *The Northwest Territories Good Building Practices 2000* (GBP) guide.

Recent projects have been designed to exceed the Canadian Building Incentive Program (CBIP) standards established by Natural Resources Canada (NRCan):

- Chief Albert Wright School project in Tulita.
- Children's Treatment Centre project in Hay River.
- Gamètì School Addition
- Ndilǫ School

The NWT Housing Corporation is participating in a 4-year study of best practices for northern building envelope design. The National Research Council of Canada, the Canadian Mortgage and Housing Corporation, and Natural Resources Canada are coordinating the study that will identify and test building envelope assemblies that are energy efficient and durable. The study will focus on the heat and moisture performance of building envelopes and their impact on the environment.

Action

Continued improvement in energy performance standards.

Outcomes

The GBP will be revised in 2008 to incorporate new technologies and updated building practices.

Best practices in housing envelope design will be reviewed, with implementation beginning in 2010.

Policy and Planning

A coordinated approach to energy policy and planning ensures that activities across the GNWT are appropriately focused on priority areas and that future energy decisions and actions reflect the Energy Policy Framework. Reporting on government-wide results to inform future versions of the Energy Plan, providing a central source of information on energy in the NWT, and representing GNWT interests at the provincial/territorial, national and international level will continue to be important ongoing actions of the GNWT.

A NWT Energy Report containing an updated environmental scan and report on results will be published in 2008. The following are two key policy and planning initiatives that also need to be addressed.

1. Review of Electricity Regulation, Rates, and Subsidy Programs

The cost of energy in remote communities is having a detrimental effect on the cost of living and the prospects for economic development. Local stores such as the one in Nahanni Butte are having trouble staying open due to high energy costs (the store's power costs were nearly $72,000 in 2006). A key principle in the Energy Plan is affordable power for all residents. In order to accomplish this, the regulation of energy, the provision of subsidies and the way in which rates are established need to be reviewed and all opportunities to reduce costs need to be explored.

The Public Utilities Board currently determines separate "regulated" electricity rates in every community through a quasi-judicial process (an estimated cost of $1 million per year including Board consultants and administrative cost). This method of electricity rate determination, and its cost, need to be reviewed to ensure that electricity is as affordable as possible. The Territorial Power Subsidy Program (TPSP) also needs to be reviewed.

Regardless of the method used to determine electricity rates, the GNWT should determine whether or not the present regulatory process is in the best interest of Northerners. In this regard the benefits and costs of alternatives to having a Public Utilities Board need to be examined.

One of the benefits of public ownership of NTPC, in addition to enabling the government to make long-term sustainable energy investments, is that the GNWT receives a substantial annual dividend from the Corporation ($3.5 million in 2006). The current dividend policy with NTPC was originally intended to cover the costs of the Territorial Power Subsidy Program, but with costs of $8.3 million in 2005/06, this is not currently the case.

Action

The GNWT will undertake a detailed review of electricity rates, regulation, subsidization, the current GNWT dividend policy with NTPC, and other tools available to government.

Outcome

Options to reduce over-all system costs and provide affordable electricity to all NWT residents will be developed for the consideration of the Northwest Territories Legislative Assembly in 2008.

2. Devolution Planning

As progress is achieved in devolution negotiations, the GNWT will need to work with Aboriginal governments to assume responsibilities for the management of the north's lands and resources. Two projects include:

- Review organizational designs for a post-devolution environment; and
- Review the current fiscal and regulatory regimes and identify possible options for the future that will ensure the NWT receives fair compensation from the development of its energy resources.

Photo: Northwest Territories Power Corporation

Snare Cascades Spillway

7 Energy for the Future

THE LONG-TERM APPROACH

Long-term Planning and NWT Macroeconomic Strategy Development

Long-term energy planning in the NWT needs to consider opportunities for petroleum and electricity exports, alternative sources of energy supply, the cost of energy in communities, and the pace at which local and export demand can and should be addressed by project development in the NWT.

Energy demand in communities is fairly predictable and the economics of small, isolated grids are straightforward. The key issues are therefore;

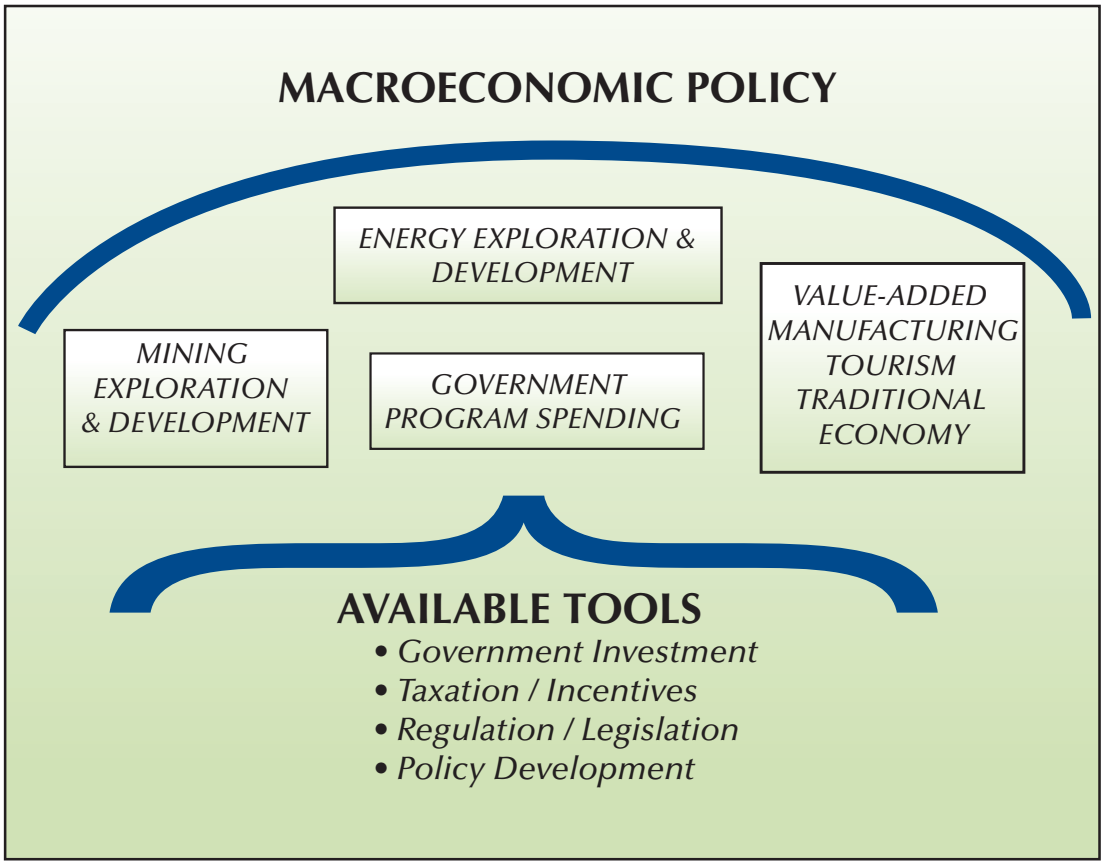
- Keeping abreast of energy developments in the global and North American energy markets;
- Contingency planning;
- Remaining current with respect to alternative and emerging technology development; and,
- Influencing the future direction of the NWT economy.

As a resource-based economy, demand for our mineral and petroleum wealth could provide opportunities to diversify our energy supplies and, by leveraging the energy requirements of northern resource developers, provide affordable energy for communities.

The reliance on imported petroleum products makes citizens individually, and the government collectively, vulnerable to spikes in the price of crude oil. Because of this, the GNWT needs to examine available options for protecting northerners and the government from sudden and prolonged increases in the price of crude oil. An investment in emerging technology and alternative energy sources will achieve this to an extent. Utilizing local sources for most of our energy needs is the goal in the long-term.

The GNWT will be better able to assist northerners faced with sharp increases in energy prices following the successful realization of devolution as it will see its own revenues grow with the increase in the world oil price.

Ultimately, the options available will be influenced by the nature and pace of future resource development in the NWT. The GNWT is currently undertaking Macroeconomic Policy development aimed at mapping out the likely growth of the economy overall and the anticipated sequence of development, across all sectors of the economy. The GNWT will then be positioned to influence economic variables such as economic growth, employment, production, and prices through such tools as spending, taxation, regulation and trade policies. Macroeconomic policy analysis seeks to answer questions about what policies will lead to net growth, and which may slow the rate of growth. This needs to be considered in the overall government approach to the economy, as shown below. Energy planning will be a substantial part of the overall approach due to its significance to our economy.



Potential Long-term Energy Development

As part of the overall macroeconomic policy planned for the NWT, looking forward, major energy developments could include:

- **2009** – greater use of renewables such as wood pellet boilers, and solar power for hot water heating, expanded residual heat and combined heat-power systems, and at least one operating wind turbine.
- **2009** – northern hydro power being sold in the Slave Geological province to NWT diamond mines.
- **2012** – some mini-hydro facilities could possibly be built in some communities by this time, although current evidence suggests that subsidies will be required in order to keep the cost of energy affordable.
- **2013** – conversion to natural gas in communities where it is economic to do so.
- **2013** – further development of hydroelectricity on the Snare River.
- **2014** – could see the first hydro power from a development on the Bear River being utilized by MGP pipeline compression stations, or other future industrial developments.
- **2018** – an interconnected North and South Slave grid could be developed, backstopped by continued development in the Slave Geological province.
- **2020 to 2025** – building on the corridor established by the Bear River development, power from the Mackenzie River could be exported to southern markets.

While the earlier opportunities listed above are clear objectives of this Energy Plan, later developments such as hydro development on the Mackenzie River would depend on market conditions in the south as well as the overall macroeconomic planning approach to development.

Energy planning is a lengthy process (the MGP will take at least 10 years), and considerable, ongoing investment will be required if many of the possibilities identified above are to become a reality. Ultimately, development of the North's resources will depend on the economic feasibility of projects, environmental impact considerations, and the nature and pace of development that northerners find acceptable.

Northwest Territories

Current and Potential Energy Transmission Infrastructure

Appendix A

NWT Energy Sector Overview

The NWT has abundant petroleum and renewable resource potential. In petroleum supply, there may be 12 billion barrels of potential oil reserves and 75 trillion cubic feet (tcf) of gas reserves in the Northwest Territories. On the renewable side, with over 11,000 megawatts of hydroelectric potential our northern rivers could be a source of clean, sustainable energy. Wind technologies continue to progress and have the potential in the long-term to reduce diesel consumption in our communities, while biomass and geothermal energy also show considerable promise.

Non-renewable Resources

Oil

The NWT's discovered oil reserves are estimated at about 2.8 billion barrels with an undiscovered recoverable resource of perhaps as much as 12 billion barrels. These reserves are located throughout the NWT with the largest pools in the Mackenzie Delta, the Beaufort Sea and Arctic Islands.[3] While considerable, 12 billion barrels represents a relatively small (approximately 3 percent) share of Canada's total oil reserves according to a 2003 report by the National Energy Board. The report estimated 309 billion barrels in Canada, of which 95 percent is located in Alberta's oil sands.[4]

The NWT's developed oil reserves are located at Norman Wells and at Cameron Hills.

Location	**Remaining Established Reserves** (billion barrels)	**Ultimate Recoverable Resource** (billion barrels)
Mackenzie Delta/Beaufort	1.01	6.7
Arctic Islands	0.41	4.7
Mainland NWT	0.08	0.6
Total	**1.50**	**12.0**

Table A1– Oil Reserves in the Northwest Territories[5]

[3] *A portion of which is in Nunavut.*

[4] *Canada's Energy Future, National Energy Board 2003, Figure 5.5, page 52.*

[5] *Sources: (1) Canada's Energy Future, NEB 2003. Table A5.1: Ultimate Recoverable Resources. (2) Probabilistic Estimate of Hydrocarbon Volumes in the Mackenzie Delta and Beaufort Sea Discoveries, National Energy Board, 1998. (3) CAPP Statistical Handbook, November 2006. Table 2.1A.*

Oil produced at Norman Wells is transported to Alberta via the Enbridge pipeline, in operation since 1985. Production at the Norman Wells field is now experiencing an expected decline and may only have 13-15 years of production left. The life of the oil field could be extended if the Mackenzie Valley Pipeline is built and Imperial Oil finds that it is economic to inject natural gas that is available from the pipeline into the field. In any case, the current plan is to use capacity available in the Enbridge pipeline to transport natural gas liquids from gas fields in the Mackenzie Delta and other locations.

Small quantities of oil have been produced on a sustained basis at Cameron Hills since 2003 (in 2005, production was 297,000 barrels).

Natural Gas

The NWT has large discovered reserves of natural gas, estimated at almost 11 trillion cubic feet (tcf) and an ultimate recoverable resource of at least 75 tcf. The gas reserves are mostly concentrated in the Mackenzie Delta and Beaufort Sea region. The three gas fields in the Delta that would anchor the Mackenzie Valley Pipeline are Taglu, Parsons Lake and Niglintgak, collectively accounting for about 5.8 tcf. By way of comparison, the National Energy Board estimates that Canada as a whole has about 550 tcf. of gas reserves.[6]

The NWT's developed gas reserves are at Cameron Hills, Fort Liard, Norman Wells and at Ikhil, near the Town of Inuvik. The estimated size of the natural gas resource at each of these locations and the cumulative production to date is indicated in the following table.

Location	**Produced Resource** (billion cubic feet)	**Ultimate Recoverable** (billion cubic feet)
Mackenzie Delta/Beaufort Sea		60,000
Ikhil	3.5	
Mackenzie Valley Corridor		5,000
Cameron Hills	16.7	
Fort Liard	156	
Norman Wells	137	
Arctic Islands		10,000
Totals	**313.2**	**75,000**

Table A2

The Mackenzie Valley Pipeline will likely trigger natural gas exploration in the Mackenzie Delta, the Colville Hills and, eventually, in the Beaufort Sea and the Arctic islands.[7]

Given the increasing natural gas and crude oil import requirements of the United States and that of southern Canada, and the proven and potential reserves in the NWT, oil and gas exploration and development are poised to become an increasingly important part of the NWT economy.

Coal and Uranium

The NWT holds some promise for the potential development of coal and uranium resources. Six companies spent $2.4 million in 2005 on uranium exploration in the NWT and spending was expected to be $7 million in 2006. Past development includes the Eldorado Mine near Great Bear Lake that produced over 6,400 tonnes of uranium. A significant coal deposit near Fort Liard has future development potential with possibilities for a coal gasification plant. With our substantial renewable energy sources, the potential development of NWT coal and uranium resources in the long term would be for export to southern markets rather than for domestic use.

[6] *Canada's Energy Future, pp 63-64.*

[7] *There are 40 tcf of gas reserves in the Arctic Islands, 30 tcf of which is in Nunavut.*

Renewable Energy

There are two main advantages to developing and expanding renewable energy technologies in the NWT. First, renewable technologies provide a more sustainable and environmentally friendly source of power. Second, they are an excellent vehicle for managing risk by helping to diversify the NWT's energy supply mix and act as a hedge against oil and gas price volatility.

The shift towards clean energy in Canada is accelerating as governments embrace renewable energy as part of a comprehensive plan to lower GHG emissions. However, with the notable exception of hydroelectric power, renewable energy sources will only represent a relatively small share of our total energy supply for the NWT in the short and medium term. The reliability of fossil fuels, their superior economics for energy production and the presence of existing capital infrastructure to deliver power will limit the impact of renewable energy solutions in many parts of Canada including the north. This reality is reflected in a 2006 report by the National Energy Board that notes considerable non-technical barriers stand in the way of the development and use of many emerging renewable energy technologies.[8] With some government support and subsidization, renewable technologies such as wind, geothermal, and mini-hydro may be feasible in the NWT. A recently announced renewable technology program of the federal government that provides a subsidy of 1 cent per kilowatt hour will improve economics.

Fortunately, with the increasing focus on GHG emissions, the NWT's hydro resources will become more attractive as an energy source. If the significant investments required for larger projects can be justified on the basis of industrial demand growth, the current hydro share of the NWT's energy supply mix could be expanded to serve the needs of a growing population, fuel economic growth and be available for export.

Hydroelectric Energy

Hydroelectric power currently provides 41% of the overall power generation in the NWT. Hydro is insulated from rising fuel prices and is considered environmentally friendly. Interest in harnessing the power of Canada's northern rivers is being renewed by uncertainty regarding the supply of petroleum resources in the future, the impact of rising global demand for petroleum on oil and oil product prices, and growing concern over the state of the environment. These realities have contributed to an emerging consensus that views the present as "…a prime opportunity for the Canadian North to position itself as a reliable energy supplier to the North American continent and to the energy supply grids which in turn feed continental demand."[9] Hydroelectric developments have the potential to address what is clearly the largest challenge in providing reliable, affordable energy in the NWT – the lack of economies of scale.

The vast majority of the Northwest Territories' world-class hydro potential is not yet developed. As illustrated in Table A3, the NWT has approximately 11,500 megawatts of hydroelectric potential, of which less than 0.5% has been developed.

[8] *Emerging Technologies in Electricity Generation, National Energy Board, 2006.*

[9] *Northern Powerhouse: The Untapped Energy of the Northwest Territories (Chapman and Brata Das, 2004).*

River	Developed (MW)	Undeveloped Potential (MW)	Proposed Development (MW)
Bear	0	568	126
La Martre	0	27	1
Lockhart	0	269	0
Mackenzie	0	10,450	0
Snare	30	33	13
Snowdrift	0	1	1
Taltson	18	172	35
Yellowknife	7	0	0
TOTAL	**55**	**11,520**	**176**
Slave (AB/NT)		1,500	

Table A3

In order to capture the environmental and economic benefits attributable to hydroelectric development, significant challenges must be overcome. Primary obstacles include:

- Many of the sites suitable for hydro development are far from potential markets.
- The existing load base in the NWT is too small to achieve the economies of scale necessary for hydroelectricity to be profitable at a competitive price.

Pre-development costs typically represent 5 to 10% of total capital costs. For larger projects, this represents a substantial cash outlay with a large risk component and a very long lead-time prior to any returns being realized. These factors suggest that, as in the past in the NWT, future hydro development will be dependant on industrial and/or resource development anchor customers.

In the long-term, hydro development will require vision and a proactive, long-range planning horizon. While the current focus is on meeting domestic industrial needs to facilitate the development of infrastructure, the conditions might exist in the next 10 to 20 years to export renewable power to southern markets. In addition, with the completion of the Mackenzie Valley Pipeline, the NWT will have the beginnings of an energy transportation corridor to southern markets for oil and natural gas. Pipeline compressor energy requirements could potentially make the development of additional hydroelectric power in the NWT feasible. Significant baseline analysis and feasibility work needs to be undertaken so that the NWT has the information required to aggressively pursue potential customers as development in the North proceeds and anchor customers begin to emerge.

Small Hydro

There is potential in the NWT to develop small hydro facilities, of about 1 MW of capacity, on rivers such as the La Martre (Whatì) and the Snowdrift (Łutselk'e). While such developments can reduce environmental costs by nearly eliminating diesel generation in the communities involved, the generation costs will tend to be high because of relatively high capital costs. For this reason small hydro facilities will likely require financial support. Further, to ensure reliability, the existing diesel generators would still need to be maintained. The small electricity load in most NWT communities makes it difficult to justify investment in mini-hydro facilities on a purely economic basis. However, if other sources of funding can be secured, such as federal government funding, projects like these may be able to proceed with no substantial increase in local energy rates.

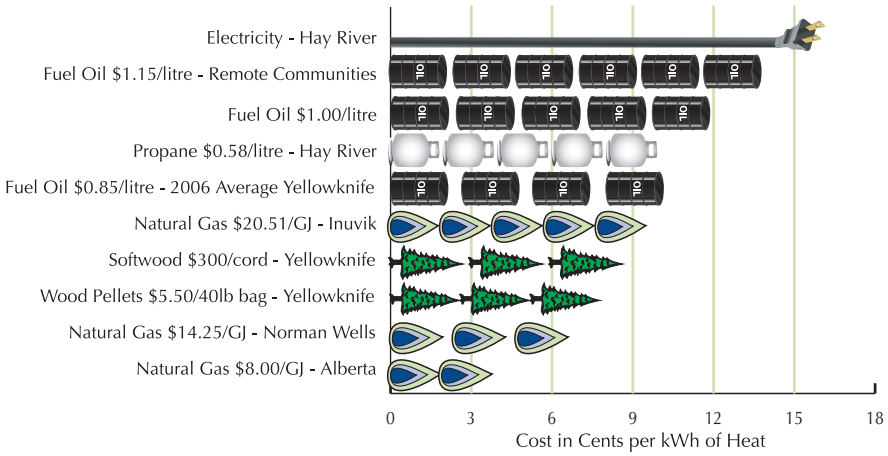
Biomass

Wood is widely used for supplementary home heating in the North and wood pellets are emerging as an economical, reliable, and environmentally friendly fuel for both residential and commercial heating. Wood pellets present a new opportunity in the NWT to reduce heating costs, fossil fuel use and greenhouse gas emissions because biomass is considered carbon neutral.

Approximately 625 tonnes of wood pellets were sold in the NWT in 2006 and sales are expected to grow substantially in future years. The North Slave Correctional Centre in Yellowknife is purchasing heat from two large, commercially-owned wood pellet boilers, resulting in energy savings. Further opportunities are being examined for commercial use.

For residents, wood pellets are generally used as a secondary source of heat. Wood pellet stoves are more efficient than regular wood stoves and have comparable or lower particulate emissions. At current prices wood pellets are cheaper than most other fuel sources in the NWT, including soft wood at $300 per cord. Figure A1 shows energy costs for home heating. The cost is given per kWh of heat and incorporates the efficiency of typical furnaces and stoves.[10]

Figure A1
Home Heating Energy Service Costs



Wind Energy

Wind is an attractive energy source because of its low environmental impact and its ability to reduce dependence on fuel. When combined with diesel-generated electricity in remote communities, wind power offsets diesel use and reduces greenhouse gas emissions. As an intermittent power source, wind technology complements hydropower facilities that have water storage capability, as is the case in the NWT. Numerous factors currently point to wind as an alternative energy source for the NWT: advances in small wind technology, the establishment of turbines in other cold-climate regions, the increased cost of fossil fuels, and concerns regarding climate change.

[10] *Efficiencies were obtained from the Environmental Protection Agency (EPA) and the Energy Information Administration (EIA): 78% for furnaces (diesel & natural gas) and wood pellet stoves and 63% for ordinary wood stoves.*

Wind energy can become economically viable at speeds greater than approximately six metres per second (m/s). Data is available on NWT wind resources based on local airport data and an extrapolation using the Canadian Wind Atlas. This data is not sufficient to establish the feasibility of wind development in any particular location, but does provide an indication of where opportunities may lie.

Currently, there are anemometer towers in Paulatuk, Sachs Harbour, Inuvik, Tuktoyaktuk, Yellowknife and Ulukhaktok to gather data on the wind resource at each site. The anemometer towers provide true measures of the wind resource for potential turbine installations.

While wind power holds promise for meeting a portion of NWT electricity requirements and can displace the amount of diesel fuel consumed in remote communities, the costs of maintaining back-up infrastructure remain. Appropriate generation capacity is required for times when there is insufficient wind velocity.

Geothermal

Circulating fluids underground well below the frost line can be an efficient means of taking advantage of heat energy stored below the earth's surface. In the North one would generally have to go further underground to harvest this form of energy than further south. The rocky topography of the Canadian Shield throughout much of the North would make this impractical for heating small buildings on an individual basis. However, geothermal heating may be available from abandoned underground mine shafts which are already well below the earth's surface. Con Mine in Yellowknife is one site that is being examined, and there is an opportunity to implement a pilot project utilizing heat pumps at Aurora College in Fort Smith.

Solar

There are three types of solar energy technologies already in use in the NWT: passive solar, solar water heating, and photovoltaics (PV). Passive solar involves designing buildings to harness the sun's energy and offset other forms of heating with little or no additional cost. Solar water heating is provided by solar panels which absorb the sun's energy and transfer it to the hot water system of a house or business. These systems can reduce the energy needed to heat water by 50% in some NWT locations. The NWT Housing Corporation has invested in 17 solar hot water panels for testing.

PV is a source of electricity production from solar energy. Although still expensive, it is highly reliable and is currently used in niche applications throughout the NWT.

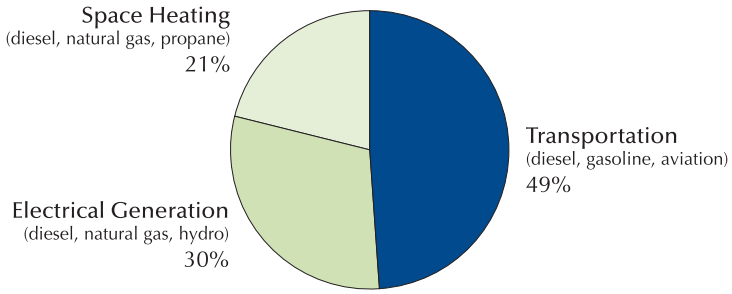
Energy Use

The graphic below, Figure A2, shows how much energy is consumed in the NWT in each of the transportation, electricity, and heating sectors. Petroleum fuel volumes are converted to equivalent energy amounts (gigajoules) for comparison purposes.

Figure A2

NWT Energy Use

19.8 million gigajoules in 2005



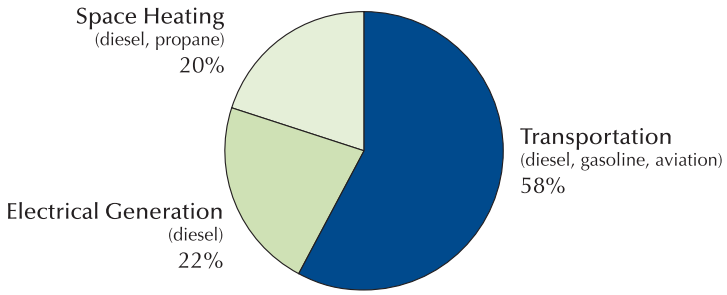
Transportation

As can be seen in Figure A3 below, the transportation sector utilizes the majority of liquid fossil fuels (diesel, gasoline, propane) consumed in the NWT. Due to vast distances, a dispersed population, and economic development in the NWT, the use of fossil fuel for transportation will continue to grow. NWT highway system improvements and electronic transportation systems to advise commercial trucking and the public can make some impact by optimizing travel. National regulations concerning biofuels, fuel efficiency, and consumer behaviour can also make a difference. However, the greatest opportunity for action by the GNWT to reduce energy and fossil fuel use appears to be in electricity generation and space heating. The Taltson Hydro Expansion Project, for example, would reduce diesel consumption at the mines by an estimated 108 million litres per year. The reduced need for the transportation of fuel to the mines would reduce transportation fuel use by 6 million litres per year and remove approximately 1,800 Super B tractor-trailer units from NWT highways each year.

Figure A3 (Figure 2– Section 3 Background)

NWT Fuel Consumption by Sector

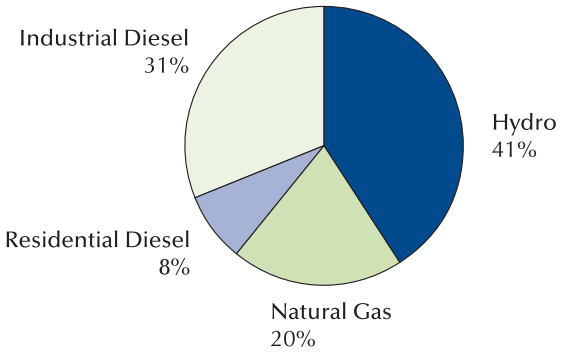
2005/06 - 445 million litres, estimated



Electricity Generation

There are three main sources of electricity generation in the NWT: natural gas, diesel and hydro. Natural gas is used for electrical generation in Inuvik and Norman Wells. Diesel plants serve 23 communities and four diamond mines. Hydroelectric power stations on the Snare, Yellowknife and Taltson Rivers provide power to eight communities near Great Slave Lake.

Figure A4 *(Figure 1 Section 3 – Background)*
2005/06 Electrical Generation

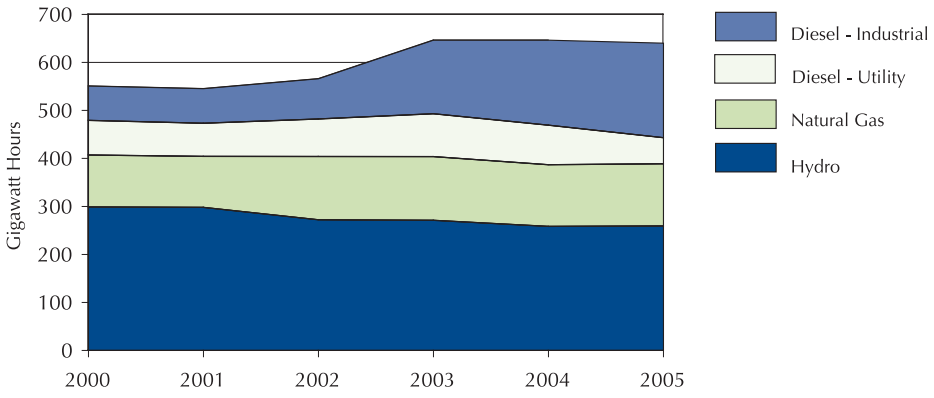


Between 2000 and 2005, annual electrical generation increased by 16% and a number of trends emerged:

- Industrial diesel generation grew by 174%
  - Diamond mine development is the principal cause for the increase
- Natural gas generation grew by 16%
  - A result of the conversion of Inuvik to natural gas
- NTPC diesel generation decreased by 25%
  - Mainly due to the availability of hydro power from the Bluefish dam and the closure of the Giant and Con mines in Yellowknife. The conversion of Inuvik to natural gas is also an important factor.

Over the last five years, diesel use for electrical generation has been growing, as shown in the graph below.

Figure A5
5 Year Electrical Generation Trends



The trend of increasing fossil fuel use for generation purposes will continue to rise as diamond mines (Snap Lake and Gacho Kue) and the proposed Mackenzie Valley Pipeline become operational. The use of northern renewable energy such as wind and hydro should be encouraged to displace the amount of fossil fuels utilized in developing the north.

Space Heating

Space heating in the NWT is provided by heating oil, natural gas, propane, wood, and in a few instances, wood pellets and electricity. Heating oil is the primary source of heat in the majority of buildings in the NWT. Natural gas is the primary source in Norman Wells and Inuvik while over half of the homes in Hay River use propane. Wood is widely used for supplementary heat and wood pellets have recently emerged as an option for primary heat in large buildings through the installation of wood pellet boilers.

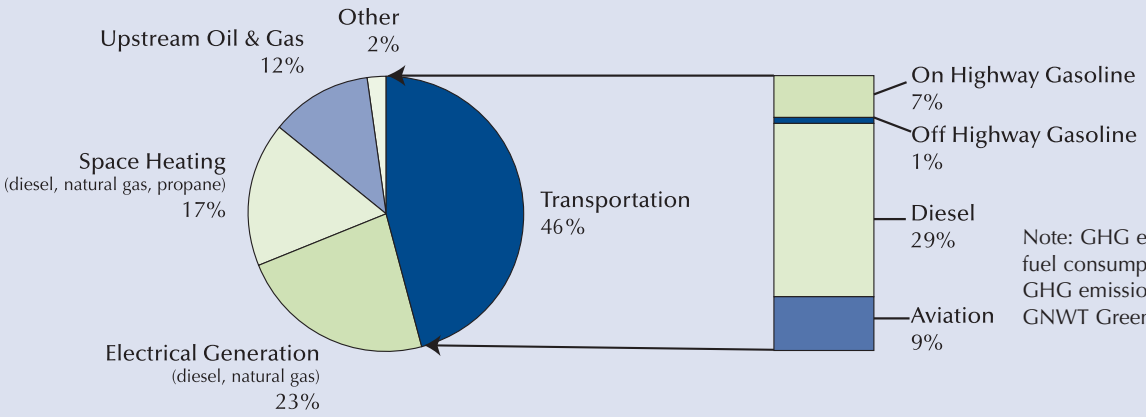
The consumption of energy for space heating has grown relatively slowly in recent years, and is now consuming a smaller portion of total energy use. Heating oil's share of total fuel (diesel, gasoline, and propane) sales declined from 26% to 20% between 1999/00 and 2005/06.

Appendix B

Energy and the Environment

Climate change in the Northwest Territories is causing permafrost to thaw, summer sea ice to decrease in thickness and extent, precipitation patterns to change, and the ranges of plants and animals to alter. These changes in the environment are especially profound in the north as average temperatures in the Arctic have increased nearly twice as fast as in the rest of the world.[11]Globally, 80% of greenhouse gas (GHG) emissions are the result of the combustion of fossil fuels.[12] Fossil fuel use in the NWT produced an estimated 1.7 megatonnes of greenhouse gases in 2001. While the NWT contribution to GHG emissions may not be significant on a national scale, (less than three-tenths of one percent of Canada's emissions), on a per capita basis, the NWT comes in at nearly twice the national average.

Figure A6 *(Figure 3 – Section 3 Background)*
GHG Emission Sources



Note: GHG emissions represented by fuel consumption. For a representation of GHG emissions by sector please see GNWT Greenhouse Gas Strategy page 9.

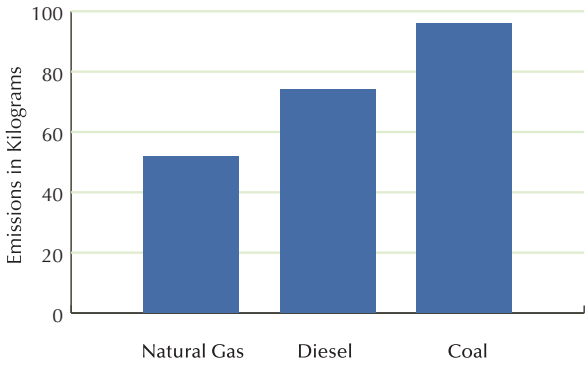
As shown above, transportation is the biggest source of GHG emissions. Diesel consumption for transportation produces 29% of total GHG emissions, which can be reduced through such actions as displacing the diesel imported to generate electricity at diamond mines.

The proposed Mackenzie Valley Pipeline will create approximately 1.7 megatonnes of GHG emissions annually, effectively doubling emissions in the NWT.[13] However, increasing the supply of natural gas in southern markets should displace some of the increased use of coal for electricity generation and contribute to national GHG reduction objectives (coal is the number one source of generation in Alberta and Saskatchewan).

[11] *ACIA, Impacts of a Warming Climate: Arctic Climate Impact Assessment. Cambridge University Press, 2004.*
[12] *ACIA, ibid.*
[13] *Presentation to JRP, Imperial Oil Resources Ltd. October 17th, 2006. Yellowknife.*

The potential also exists for converting some NWT communities to natural gas. The conversion of Inuvik to natural gas from the Ikhil field in 1999 has reduced GHG emissions by 13 kilotonnes per year.

Figure A7
CO_2 Emissions per 100 kWh of Electricity
Various Fuel sources



Appendix C

Energy and the Economy

Energy Costs

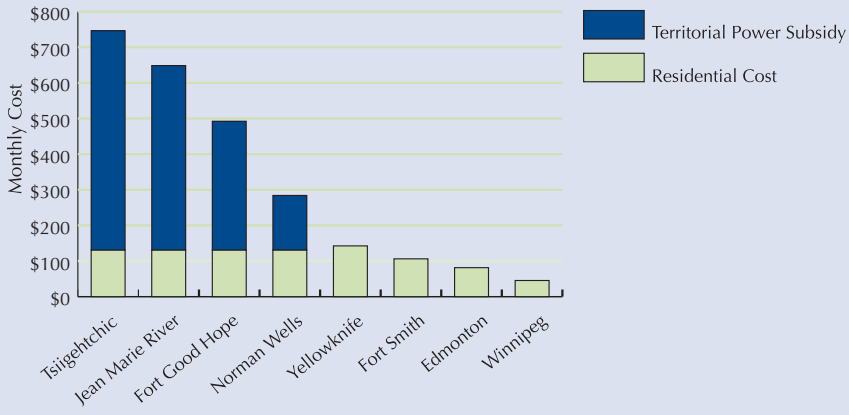
Energy in the NWT is very expensive due to a lack of economies of scale and our small, dispersed communities. Although fuel is an important component of the cost of electricity, the high cost is mainly the result of the small size of our communities. For example, while both Fort Liard and Nahanni Butte are served by diesel, the electricity rates in the former are less than half those in the latter primarily because of their relative sizes.

The high cost of energy also acts as a barrier for local economic development. Only high value commodity industries such as diamonds can afford to operate in such a high energy cost environment.

Energy costs are a major contributor to living costs throughout the north. According to NWT surveys, average annual household spending on heating fuel, electricity, and water rose from $3,600 in 2003 to $4,700 in 2005. As well, energy subsidization programs are significant. The NWT Housing Corporation contributed $11.6 Million to support 2,300 public housing units in 2005/06 (subsidized heat and fuel costs for public housing tenants). In addition, electricity rates in isolated communities are extremely high and cost the GNWT $8.3 million in 2005/06 through the Territorial Power Support Program (TPSP) and over $1 million in the provision of petroleum products for NWT communities not served by the private sector.

Electricity rates for residents are generally successfully subsidized by the GNWT as shown in the figure below that compares current electricity rates in the NWT with those in Edmonton and Winnipeg.

Figure A8 (Figure 5 – Section 3 Background)
Monthly Power Bill for 700 kWh of Electricity – 2006



The provision of affordable power for NWT businesses is not as successful. The commercial segment of the TPSP subsidizes the first 1000 kWh of electricity each month for businesses with gross annual revenue of less than $2 million per year. Few businesses apply and only $113,000 was spent on the program in 2005/06.

Energy's Contribution to the Economy

Energy makes a significant contribution to the NWT's economy. For example:

- Between 1994 and 2004, $1.5 billion was spent on oil and gas exploration and development.
- Oil and natural gas production accounted for $524 million or 13% percent of the NWT GDP in 2005.
- Oil and gas royalty payments to the Federal Government amounted to $146 million in 2005/06 ($14 million in royalties and $132 million for their ownership share in the Norman Wells field).

Oil and Gas Exploration

Spending on exploration for oil and gas more than doubled during 2005, totaling $395 million compared to $184 million the year before. Spending on new wells was $192 million while $144 million was spent on re-entries of existing wells and about $59 million on seismic and other geological programs. Five exploratory wells were drilled in the Mackenzie Delta-Beaufort Sea area and six in the Sahtu.

The contribution of energy to the economy will rise significantly with the operation of the Mackenzie Valley Pipeline, which is expected to contribute $724 million annually to the NWT's GDP. In addition, the recently signed Socio-Economic Agreement between the GNWT and the Mackenzie Gas Project will ensure significant and ongoing benefits to northern residents and businesses.

Construction of the Mackenzie Valley Pipeline could trigger major investment in electrical generation and transmission to power pipeline compressors. The GNWT needs to be prepared to leverage these opportunities when they emerge.

Resource Revenues

Crown revenues from oil and gas production alone totaled $146 million dollars in 2005. The GNWT, with Aboriginal organizations, is negotiating with the Federal Government to secure a fair share of the resource revenues that will flow from future petroleum and mineral development. Resource and tax revenues from large-scale projects could provide the economic foundation for northern governments for years to come.

Appendix D

Energy Outlook

Oil Demand, Supply & Pricing

The consensus view appears to be that the price of oil will fluctuate in the U.S. $45/bbl to $65/bbl range through the next ten to twenty years.[14] The U.S. Department of Energy's Energy Information Administration's (EIA) 2007 Annual Energy Outlook reference case, and the December 31, 2006 forecast of Calgary-based Sproule Associates Limited, are consistent with this view. Oil prices as high as $80 per barrel would not likely be sustainable on a long-term basis, at least within the 20-year period addressed by the Energy Plan. The global response to higher prices by consumers would likely be reduced demand followed by a rebalancing of demand and supply at a lower price level.[15]

Inevitably there will be periods when oil prices may settle above the $65/bbl level, but in developing the Energy Plan it was assumed that oil prices of $80 to $100 per barrel oil could not be sustained over the next twenty years.

The NWT will continue to have a ready market for its crude oil in the United States where the shortfall between domestic oil production and demand continues to widen. This is underscored by the fact that the EIA's 2007 Annual Energy Outlook report projects that U.S. imports of crude oil and other liquid fuels will increase by 4.7 million barrels a day or 36% between 2005 and 2030.

Natural Gas Demand, Supply & Pricing

In North America the price of natural gas is determined on a continental basis. The continued growth of natural gas demand in the U.S., coupled with the decline in domestic supply, appears to have resulted in a permanent upward adjustment in the price of gas. As a result, where gas used to trade in the vicinity of $2/mcf, market forces will now likely keep the price in the U.S. $5/mcf to $7/mcf range with occasional spikes owing to seasonal factors and supply disruptions. This view is compatible with the EIA's 2007 Annual Energy Outlook and the 2006 Annual Review provided by Natural Resources Canada. The EIA forecasts annual prices to average near $5/mcf in 2020 and near $6/mcf in 2030. The main reason for this is the competition that would almost certainly develop as more and more Liquefied Natural Gas (LNG) suppliers enter the market to take advantage of strong natural gas prices.

The EIA's 2007 Annual Energy Outlook projects that natural gas imports will increase by 2 tcf/year or 56 percent from 2005 to 2030 as the gap between domestic gas production and demand continues to widen.[16] LNG imports will represent a growing share of gas supplies in both Canada and the United States. From a continental security of supply perspective, the development of local (Canadian and U.S.) gas supply sources will also be of increasing importance.

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[14] *On December 13, 2006 the NYMEX closing price for December 2012 oil was US$65.37/bbl.*

[15] *An example of how wrong price forecasts can be is the US $22/bbl price that the National Energy Board used in its June 2003 report on "Canada's Energy Future" (Scenarios for Supply and Demand to 2025).*

[16] *In 2006 the U.S. consumed an estimated 22 tcf of natural gas of which 19 tcf was produced in the U.S. and the remainder imported, mainly from Canada.*

Fossil Fuels Use and GHG Emissions

Barring unforeseen technological advancements, the world will remain dependent on oil, natural gas and coal energy for many years to come. This is underscored by the International Energy Association's (IEA) *World Energy Outlook 2006*, which indicates that fossil fuels will account for 83 percent of the increase in energy demand from 2004 to 2030. A major reason for this strong growth is that plentiful and inexpensive coal will continue to make coal-fired electricity generation the option of choice in many countries. In fact, the same IEA report sees coal realizing the largest absolute increase in demand of any fuel during the 2004 to 2030 period. The increase will be driven mainly by power generation and will mostly occur in China and India. Substantial increases in coal consumption will also occur in other countries, including the U.S., where the EIA's 2007 Economic Outlook projects a 58 percent increase in coal consumption from 2005 to 2030.

In terms of U.S. consumption, the EIA indicates that "despite the rapid growth projected for biofuels and other non-hydroelectric renewable energy sources, and the expectation for new nuclear power plants for the first time in more than 25 years, oil, natural gas and coal are projected to provide roughly the same 86 percent share of the total energy supply in 2030 as they did in 2005".

Appendix E

GNWT Organization for Energy Matters

GNWT responsibilities for energy and related environmental matters are currently widely distributed among various departments and agencies. A list of these groups is below, followed by an organization chart depicting responsibilities for energy matters.

GNWT ENERGY DEPARTMENTS

1. **Industry Tourism & Investment (ITI)**
   - Energy, policy, planning and economic development programs
2. **Environment & Natural Resources (ENR)**
   - Environmental matters, alternative energy, conservation and efficiency initiatives
3. **Financial Management Board Secretariat (FMBS)**
   - Administration of the Territorial Power Support Program
4. **Public Works & Services (PWS)**
   - Management of GNWT Assets and Petroleum Products Supply for 15 Communities
5. **Northwest Territories Power Corporation (NTPC)**
   - Responsible for generation and transmission of energy throughout the NWT on a safe, economic, efficient and reliable basis
6. **Northwest Territories Housing Corporation (NWTHC)**
   - Manages 2300 public housing units in the NWT and delivers programs that target energy conservation and efficiency measures.
7. **Education, Culture, and Employment**
   - Provides funding to the Aurora Research Institute, some of whose projects are energy-focused.

Note: Various other GNWT departments address energy issues through the normal course of operations.

AGENCIES

1. **Public Utilities Board (PUB)**

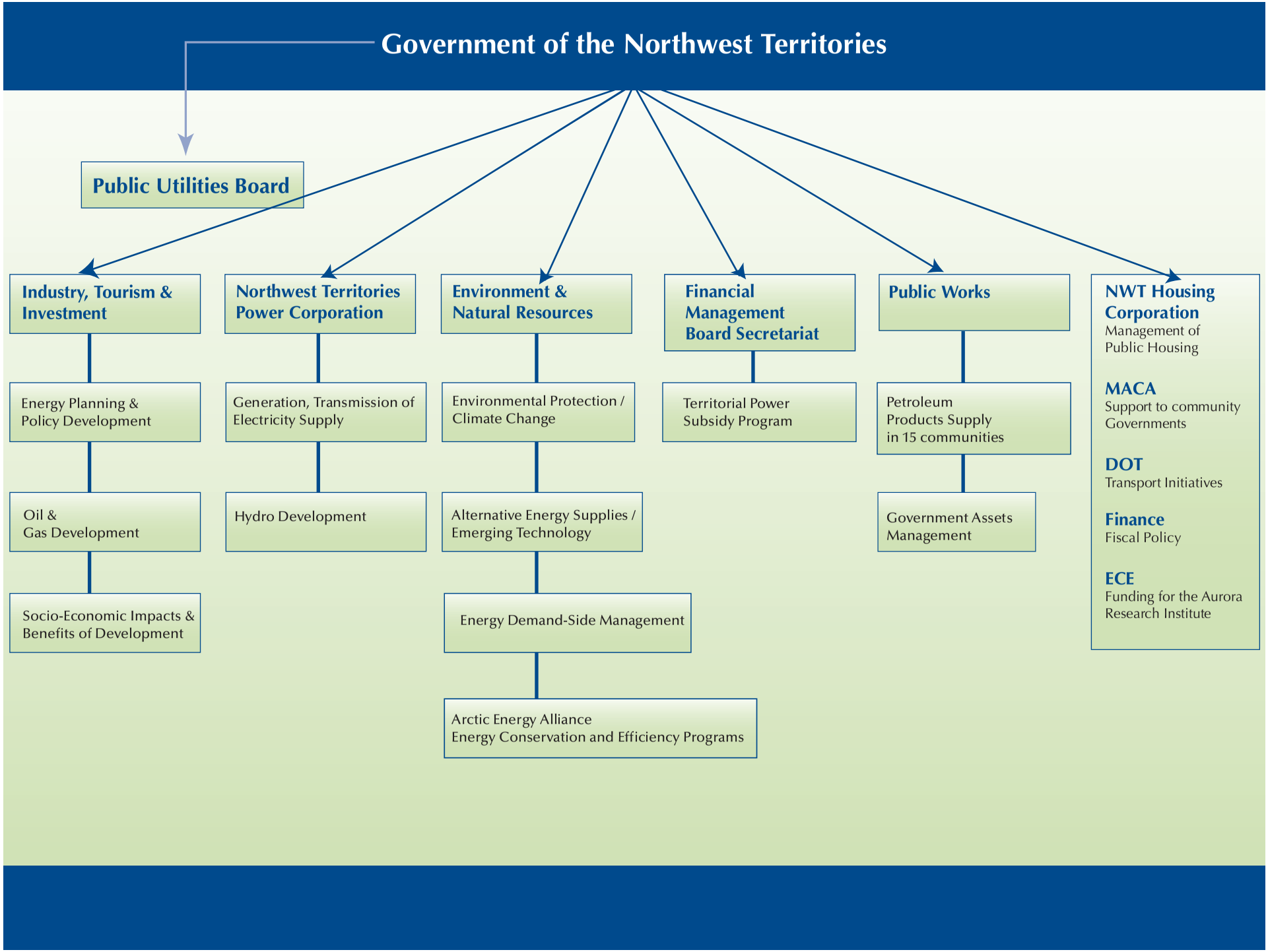
   The PUB is an independent, quasi-judicial agency of the Government of the Northwest Territories. It is responsible for the regulation of public utilities in the NWT. The Board is comprised of up to five members.

2. **Arctic Energy Alliance (AEA)**

   The Arctic Energy Alliance is a not-for-profit society established in 1997 to assist communities, the territorial government, business and consumers to work together to reduce the costs and the environmental impact of energy use and utility services in the NWT.

3. **Aurora Research Institute (ARI)**

   The ARI is involved in wind monitoring activities and is partnering with the Japanese Petroleum Exploration Company and other Canadian and international organizations to research the development of gas hydrates.


Government of the Northwest Territories
Public Utilities Board
Industry, Tourism & Investment
Energy Planning & Policy Development
Oil & Gas Development
Socio-Economic Impacts & Benefits of Development
Northwest Territories Power Corporation
Generation, Transmission of Electricity Supply
Hydro Development
Environment & Natural Resources
Environmental Protection / Climate Change
Alternative Energy Supplies / Emerging Technology
Energy Demand-Side Management
Arctic Energy Alliance
Energy Conservation and Efficiency Programs
Financial Management Board Secretariat
Territorial Power Subsidy Program
Public Works
Petroleum Products Supply in 15 communities
Government Assets Management
NWT Housing Corporation
Management of Public Housing
MACA
Support to community Governments
DOT
Transport Initiatives
Finance
Fiscal Policy
ECE
Funding for the Aurora Research Institute

Appendix F

Below is a table describing existing Government of the Northwest Territories (GNWT) activities related to energy, organized in the Key Action Areas of the NWT Energy Plan. The amount of the expenditure has been identified for some specific activities and programs. For broad programs that span other program areas such as mineral development or training programs for residents, an estimated allocation directed specifically towards energy has not been provided. The intention of this Appendix and the previous Appendix E is to provide an overview of existing GNWT programs and departmental responsibilities.

EXISTING GNWT ACTIVITIES AND INVESTMENTS

NWT ENERGY DEVELOPMENT AND SUPPLY		2006/07 Funding
Oil and Gas Development	**Various**	
Most GNWT departments have a role to play in the development, and in preparing for development, of NWT oil and gas resources. The Department of Education, Culture and Employment invests substantially in oil and gas training programs, the Department of Industry, Tourism and Investment promotes oil and gas as well as mineral exploration and development, negotiates socio-economic agreements with mining and oil and gas developers, and contributes towards GNWT-wide efforts in preparing residents and communities to maximize the benefits and mitigate the impacts of development. The Department of Environment and Natural Resources manages GNWT representations in environmental assessment and regulatory processes and ensures that appropriate measures are in place to maintain the integrity of the natural environment.		
Electricity Generation and Hydroelectric Development	**Northwest Territories Power Corporation**	
NTPC generates hydro-electric and diesel-fired power in 27 communities (Northlands Utilities provides power to 6 communities). New hydro development, such as the proposed Taltson expansion, is also led by NTPC.		
ENERGY CONSERVATION AND EFFICIENCY		**2006/07 Funding $1,047,500**
Arctic Energy Alliance (AEA) Funding	**Various**	**$192,500**
The AEA is a not-for-profit society established in 1997 to help communities, consumers, producers, regulators and policy makers to work together to reduce the costs and environmental impacts of energy and utility services in the Northwest Territories. Core funding for AEA management, admin support, and office space is provided by Environment and Natural Resources ($50,000), Municipal and Community Affairs ($50,000), NWT Housing Corporation ($50,000), NWT Association of Communities ($5,000), Public Utilities Board ($12,500), and the NWT Power Corporation ($25,000).		

Community Energy Planning	***MACA / AEA***	***$150,000***
Funding for the Arctic Energy Alliance to fund a full time Community Energy Planner to assist communities.		
EnerGuide for Houses	***ENR/AEA***	***$70,000***
The EnerGuide for Houses program was first launched by the Federal Government in 1998, but funding was discontinued in May of 2006. The territorial government is now funding the program, and needs to enhance support, in the absence of federal funding.		
Energy Management Program	***ENR/AEA***	***$210,000***
Contribution funding to the Arctic Energy Alliance for staffing and materials related to energy information and public awareness, as well as staffing for an Energy Auditor.		
Energy Conservation Program	***ENR***	***$220,000***
This program encourages the efficient use of energy and water, through funding for retrofit projects that reduce consumption. The ECP has historically been application-based, available to GNWT departments, community governments, and non-government organizations.		
Winterization Workshops	***ENR / AEA***	***$110,000***
Home winterization workshops were offered in 12 communities to teach the skills of home energy efficiency.		
Transportation Initiatives	***DOT***	
Intelligent transportation system applications to minimize unnecessary vehicle delay and/or travel i.e. Variable Message Signs/New DOT website. Also, a number of initiatives and studies aimed at reducing energy consumption as well as evaluation of alternative energy solutions in remote camps. The Department has just released a Facility Energy Use Assessment RFP. Commercial truck and motor vehicle regulations and technology are also being assessed for energy efficiencies i.e. speed limiters.		
Energy Conservation Education and Awareness	***ENR***	***$20,000***
Production of DVDs for homeowners providing energy conservation and efficiency advice.		
Energy Assessment Program	***NTPC***	***$75,000***
NTPC has partnered with both the Federal and Territorial Governments to offer residential energy audits in the communities that it serves.		
Streetlight Changeouts	***NTPC***	
Since 2002/03 NTPC has worked with 11 communities to change the streetlights from older Mercury vapour to more efficient high-pressure Sodium lights.		
Public Housing Energy Programs	***NWTHC***	
The NWTHC has operated a number of programs over the past year aimed at reducing energy costs for public housing units. These include replacing old space heating appliances with new, energy efficient models; a grey water recycling project; and the testing of solar hot-water heaters.		

ALTERNATIVE ENERGY AND EMERGING TECHNOLOGIES		2006/07 Funding $30,000
Wind Resource Monitoring Program	**ARI / ENR / ITI**	**$30,000**
Wind speed monitoring in Yellowknife & the Beaufort region. Anemometers were installed in 2005 and 2006 in a total of six communities.		

REDUCING ENERGY USE IN GNWT ASSETS		2006/07 Funding $308,000
High Performance Heating Systems	**NWTHC**	**$54,000**
High Performance heating systems are being tested through 8 installations: 4 in Hay River, 2 in Inuvik, and 2 in Norman Wells.		
Energy Performance in Existing Buildings	**PWS**	**$100,000**
Monitoring of energy performance using infrared thermal scanning and other tools.		
Energy Performance in New Facilities	**PWS**	
New building standards will ensure that all new public buildings in the NWT are built to be energy efficient. The result will be lower energy use and lower energy costs.		
Ferry Efficiency	**DOT**	**$20,000**
A program to test and improve fuel efficiency in ferries.		
Hybrid and Efficient Vehicle Testing	**DOT**	**$70,000**
In 2006 one hybrid and one Smart Car were purchased and a second hybrid was leased. Their performance will be monitored.		
Supplementary Heater Testing	**DOT**	**$64,000**
Testing of supplementary heaters to reduce idling in maintenance vehicles.		
Utility Tracking System	**PWS**	
A system, initiated in 2001, to track electricity and fuel use in government departments.		
Vehicle Fleet Guidelines & Smart Driving Program	**DOT**	
The program strengthens employee awareness of guidelines and includes driver training to reduce fuel consumption. It also involves improved monitoring of fuel consumption.		

POLICY AND PLANNING		2006/07 Funding $21,206,000
Public Utilities Board	**Executive**	**$330,000**
This covers the Board expenses, but not the costs incurred by utility companies for the regulatory review process.		
Fuel Price Subsidization	**PWS**	**$976,000**
Public Works and Services subsidizes fuel in the 15 communities which it serves through a Grant-in-Kind from the GNWT for financing charges ($187,000) and amortization of capital ($789,000).		
Preparation of Emissions Inventories	**ENR**	
Greenhouse gas emissions inventories are completed every five years and were first completed in 2001.		
Territorial Power Support Program	**FMBS**	**$8,300,000**
Subsidizes community power rates to the Yellowknife rate for the first 700 kwh.		
Utilities Subsidies	**NWTHC**	**$11,600,000**
The Housing Corporation pays the full costs of heating fuel for 2,300 housing units ($6.06M), and subsidizes electricity to $0.06 per kWh ($5.5M).		
SPECIFIC PROGRAM SPENDING		**$22,144,000**

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Industry, Tourism and Investment
Environment and Natural Resources